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UNIVERSITY OF ALBERTA

The Effects of Cueing on the Word Retrieval Performance of Left Hemisphere Stroke Survivors

BY

(C) Patricia C. Blair

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

IN

Special Education

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

EDMONTON, ALBERTA

FALL, 1991

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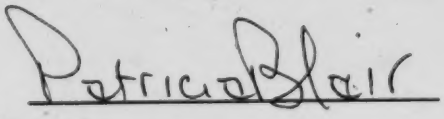

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The undersigned certify that they have read, and recommends to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled **THE EFFECTS OF CUEING ON THE WORD RETRIEVAL PERFORMANCE OF LEFT HEMISPHERE STROKE SURVIVORS** submitted by **PATRICIA BLAIR** in partial fulfillment of the requirements for the degree of **DOCTOR OF PHILOSOPHY** in **SPECIAL EDUCATION.**

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ABSTRACT

This study proposed to investigate word retrieval deficits and the efficacy of cueing strategies in the treatment of such deficits. Also to be considered were such factors as the role of linguistic class, the difference(s), if any, between "word finding" and "anomia," and the role of frustration.

Five subjects meeting the selection criteria were selected. Individuals with history of left hemisphere stroke comprised the sample. Education level, age, time post-onset, handedness, and sensory acuity were all criteria for the selection of subjects.

Each of the selected subjects was followed for a period of 10 weeks. Every other week, a session of "word retrieval tasks" utilizing one of five types of cueing was carried out. The five conditions were "phonemic," "semantic," "contextual," "indirect" and "no cue." The retrieval of both verbs and nouns was sampled. Two levels of nouns, exemplar and category, were utilized. All subject responses were recorded in writing and on audio tape.

Responses were later analyzed and coded into one of five categories: correct, incorrect and unrelated to the target, incorrect but phonemically related to the target, incorrect but semantically related to the target, and responses.

Results were analyzed and presented on a within-subject and between-subject basis. The results were used to generate several hypotheses and conclusions. Among these was the general finding that subjects did benefit from cueing, with the "phonemic cue" or the "semantic cue" being maximally effective for all subjects. This was reflected in the level of retrieval accuracy and in the time required to retrieve. It was hypothesized that, in some cases, rather than the nature of the cue being of utmost importance, it was the ability of the cue to direct or focus the linguistic search. This supported the Collins and Loftus (1975) assertion that the stroke survivor has lost the ability to make meta-linguistic decisions required for successful storage and retrieval.

In relation to linguistic class, the retrieval of categories was found to be most difficult, again supporting the notion of impairment at the higher levels of conceptualization. Thus comparison, contrasting, class inclusion and exclusion were difficult.

The role of perception was highlighted by the results of this study. Caremazza, Berndt and Brownell (1982) spoke of low level perceptual skills being required to restrict the lexical search for a word. In many cases, it appeared a lack of knowledge as to "how" and "where" to search was present.

In general, contextual information did not enhance retrieval and, as William's and Canter (1987) and Pierce and DeStefano (1978) found, can even impede retrieval. Each of these findings were discussed in detail.

Limitations to this study were listed and included the small sample size, subsequent generalizability, and lack of information of perceptual functioning of each subject.

This study generates many considerations for future research. There must be a cost efficient system set in place to provide a data base by which stroke survivors can be evaluated. This could be done at the entry level of admission to nursing homes, residential lodges and auxilliary hospitals. Also clearly needed is the development of a differential diagnostic tool to be used to determine appropriate treatment techniques following a stroke. Since the responses of each subject were idiosyncratic, to generalize patterns of response and subsequent intervention would be inappropriate.

Consideration must be given to the ethical concerns of this matter including the monetary cost, time investment and payback of training strategies to enhance word finding.

Finally, whether similar or differing problems face the learning disabled must be considered. The question of whether or not the same deficit is present must be examined closely, as must the course of intervention chosen for the learning disabled population.

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CHAPTER 1

INTRODUCTION

Human communication is a complex and multifaceted process. Each "communicator" must bring to the communicative act, a wealth of cognitive, sociological and motoric information and skill. The complexity of the communicative interaction is seldom analyzed. Only when a disruption in the ability to communicate emerges, is analysis of the communication process undertaken. One such disruption in communication can result from a language-based deficit. A condition related to this language functioning commonly experienced by stroke survivors, involves word retrieval difficulties. Word retrieval problems involve a sudden disruption in ongoing spontaneous discourse, when the speaker cannot "remember" the word needed to continue. This difficulty is experienced by virtually all speakers from time to time and is only considered pathological when it occurs with increasing frequency, thus chronically interfering with verbal communication. Word retrieval difficulties result from a variety of forms of brain damage, including the following: trauma, stroke, space-occupying lesions, and progressive degenerative disease processes. All sources of such damage can result in many diverse symptoms and characteristics, one of which may be a word retrieval deficit. In general the type of behavior and neurological symptoms exhibited are closely related to the site and extent of the lesion. For example, the symptoms resulting from a closed head injury, involving damage to both cerebral hemispheres, are vastly different from those resulting from a right hemisphere stroke. Likewise the results of a right hemisphere stroke are different from those resulting from brain stem damage. This diversity of symptoms, characteristics and causes creates a major problem for researchers as there is, in reality, no such thing as a homogeneous group of subjects falling under the classification of "brain damage". However, many subjects have two characteristics in common: a word retrieval deficit and a more generalized deficit of memory processes. Most frequently it is found that those individuals who have suffered a left hemisphere stroke experience a word retrieval deficit.

Typically they also display mild to moderate linguistic difficulties. This is not surprising as it is commonly acknowledged to be the left cerebral hemisphere which is the primary site of linguistic processing.

A typical speaker encountering a word retrieval difficulty relies on a set of "retrieval strategies" which are frequently used to elicit the desired word. These can range from going through the alphabet to identify the first sound of the word, to describing the characteristics and function of the missing word. Most often the word is "found," but whether or not such "finding" is the result of retrieval strategies or is merely spontaneous retrieval cannot be known. Assumptions that retrieval strategies have worked may in fact reflect examples of nothing more than superstitious learning. Even so, such strategies are frequently taught to brain injured individuals in an attempt to rehabilitate their communication deficits.

Attempts to retrain, remediate and restructure this retrieval skill in the brain injured individuals have utilized a variety of techniques. Those most frequently adopted appear to be cueing strategies utilizing semantic associations. For example, carrier phrasing ("I see a ----") and sentence completion ("You cook on a ----") are frequently used in therapy for these individuals, as are descriptions ("It's in the kitchen and you use it for cooking") (Lapointe, 1985). As an alternative to semantically-based cueing, researchers, including Cermak, Strassny and Uhly (1984), as well as Nicholas, Obler, Albert and Goodglass (1985) have suggested the use of phonemic cueing (e.g., "s----").

Clearly, word retrieval problems are related to the more generally affected memory processes. All disciplines involved in the educational and rehabilitative fields would appear to agree that word retrieval is the process or mechanism by which a word is "called up" from storage. The failure to "call up" the desired word is not evidence of a loss of individual words from storage, nor of a loss of semantic information. Rather, it is evidence for the inaccessibility of a given word (Butterworth, Howard & McLoughlin, 1984). Inaccessibility today does not necessarily dictate the same tomorrow, not even later

that same day. In other words, a word which is unavailable for recall at one time may be readily retrievable at some other time. The fluctuation in accessibility of a given word across time and contexts was referred to by Gloag (1985) and Butterworth et al. (1984). Thus the retrieval process or mechanism is only temporarily ineffective. The inconsistency in being able to "call up" the desired word suggests that memory itself may not be at the root of the word finding problem, rather it is the process or mechanism involved in retrieval activity.

Research in the area of word retrieval skills slowly emerged out of aphasia research. Studies in retrieval made use of aphasic individuals. The rationale for using that population in research is based on homogeneity. In most aphasics, brain damage is restricted to a specific cortical area around the ischemic area. This differs from the head injured population for whom the damage to the cortex can be more diffuse as a result of impact with the cranium at various locations. Though homogeneity is elusive in the brain injured population, to limit a research sample to aphasics tends to allow for a "purer" sample of subjects. As a result, the type of study which word retrieval research has involved, closely parallels that of aphasia research. Word retrieval research could be considered an offshoot of broad aphasia research, having emerged from theories of brain organization. For many years, word retrieval deficits were considered virtually a part of the broader comprehension deficit characteristic of receptive aphasia. Only since the 1900's has word retrieval been viewed as being different from a comprehension deficit. Clinically the problem of word retrieval resembled behavior exhibited with the loss of a thought, indicative of the dementias. Today it is viewed for what it actually is: the inaccessibility of a label with the thought remaining intact.

With advances in technology and brain research over the past thirty years, there is an improved understanding of word retrieval deficits. There exists as a result of enhanced rehabilitative services and increased public understanding, a broader range of employment and educational opportunities for those experiencing any disabling condition. This is

particularly true at the younger ages (i.e., school age). The vast majority of these services have been directed towards those younger in age as evidenced by the proliferation of early intervention, and educational programs for special populations. Only recently has education, and more specifically special education, broadened its perspective enough to consider those exceptional individuals who are older than school aged. With the emergence of early intervention programs across North America and Europe, early intervention has grown to encompass not only those attending formal educational facilities, but also those too old to attend such institutions. Through public education campaigns, lobby groups have brought to the fore the educational/learning difficulties experienced by adults with learning disabilities, neurogenic disorders and brain injuries. Such individuals possess a genuine need for the type of intervention and services which have been almost exclusively directed towards those people who are much younger.

The gravity of the need of adult populations for educational and/or rehabilitative intervention becomes clearer when one considers the situation which currently exists in Alberta. Take for example all of those adults currently residing in extended care and auxiliary facilities in Alberta who have had some type of stroke. With the exception of acute care hospitals in the major urban centers, there is no accessibility to speech and language intervention for these individuals if they are not readily mobile. If mobile, they are then faced with lengthy waiting lists on which they are considered a low priority for treatment. Thus, for this group, numerous word retrieval difficulties as well as more global speech and language disorders are rarely diagnosed and treated. To further illustrate the lack of intervention available to the population, consider the following. The prevalence of "communication disorders" is thought to be a figure close to 10% (Milisen, 1971). Then, also, consider this estimate in light of a needs study completed in 1983 in Edmonton, Alberta. An attempt to secure speech and language services for the stroke survivors residing in the city, the study at that time estimated that in an average city of 550,000 people, 2600 would be stroke survivors (Webster, 1986). It was also estimated that 50 of

those individuals would receive treatment at any one time through existing local speech and language facilities. What of the remaining 2550? Granted, not all of the 2600 survivors would be in need of intervention. But even so, a huge proportion of those survivors would receive no significant amount of intervention following their stroke.

Clearly, with the increased need, and the increasing age of the general population, attention to the rehabilitative needs of adults with brain injury is merited. To date, however, consensus on the type of remedial strategies required is lacking. As previously stated, much of the literature in the subject area of word retrieval has been as an adjunct to the broader aphasia literature. As philosophies of brain organization and functioning change, so do the philosophies of word retrieval deficits, its theoretical underpinnings, and the remediation suggested with such a disorder. There remains much speculation and guesswork as to the success of remediation efforts, as well as concern pertaining to the ecological validity of such remedial efforts.

Through a close examination of the aphasia, and more specifically, the word retrieval literature, the emergence of word retrieval as a distinct language disorder can be followed. Likewise, developments in remedial efforts can be traced. Only recently can such tracings be seen emerging beyond the brain injured population spoken of previously. Close parallels are now emerging between word retrieval difficulties in the brain injured and the learning disabled population. Though such research is only in its infancy, perhaps it opens avenues to greater understanding and consideration of word retrieval deficits.

CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

The study of word retrieval deficits emerged as an offshoot of the more comprehensive aphasia literature. It is easy to incorrectly consider this deficit as being synonymous with aphasia. Such an incorrect conclusion is a result of the contradictory and unclear claims which have arisen through time about brain organization and function. Thus, to consider the problem of word retrieval means to consider it in the perspective of "medical beliefs" throughout history. This includes a consideration of word retrieval from the perspectives of the localization theory, field theory and functional equivalence theory of brain function. Today some researchers term word retrieval deficits as paraphasia, related to, yet separate from aphasia. Moreover, new theoretical positions continue to emerge, all of which may refine or entirely change our understanding of language and the brain. One such view is that of Yeudall (1985). Clearly a comprehensive look at the current and historical research is required to understand the problem of word retrieval.

Historically, researchers have considered many difficult conceptual questions about word retrieval deficits. The first considerations tended to deal with the universality of foci and how retrieval was related to specific theories of brain organization and function. Through such study it was found that word retrieval deficits were not limited to individuals with left or right hemisphere damage nor to those with brain stem damage, rather they tended to be pervasive across site of lesion. This added to the difficulty in relating word retrieval to a specific cortical area as in associationism, field theory or functional equivalence theories of brain function. Moreover, the deficit can occur in varying levels of severity and in conjunction with varying types of aphasia. More contemporary views of the deficit relate to the type of aphasia present, yet, the relationship between severity of word retrieval deficits and aphasia subtype is still unclear despite continued study.

Even though the exact etiological contributors to word retrieval are yet today not agreed upon, current literature is focusing more and more on remediation irregardless of the source of brain injury. Closely associated with word retrieval research and remediation are memory processes and cueing techniques. As with specific etiology, a lack of concensus exists as to the role memory plays in word retrieval difficulties. Perhaps the most perplexing problem to face researchers has been the transitory nature of the word retrieval deficit. Numerous explanations have been generated to account for this, including the roles of various parts of speech, of context, and of availability of cues or prompts. As is the case with severity and aphasia subtype, the relationship between factors which may account for the inconsistency and variability observed in word retrieval deficits remains unclear.

To fully understand a deficit in word retrieval skills, brain organization theory, memory processes and treatment successes and failures must all be examined. The trend in the last two decades has focussed on accountability. Educators and rehabilitation professionals have been forced to consider the efficacy of their techniques and practices in the rehabilitation of brain damaged individuals. This new trend toward accountability has not left word retrieval training unscathed.

History

To consider word retrieval deficits one is forced to study, to a large degree, the aphasia literature. As previously discussed, word retrieval deficits were considered to be "part and parcel" of aphasia. Reference to aphasia symptoms appears as early as 300 BC, and describes damage to the temporal area of the head, internal bleeding and paralysis which result in a state of "speechlessness" (Schuell, 1974). Similar descriptions of communicative disruption appear in M. Critchley's study of aphasia and its historical development, Aphasiology (1970). Characteristic of such early research accounts was the belief that speech rather than language was at the root of word retrieval problems. Aristotle, for example, spoke of individuals who hesitate in their speech being unable to control words and explain meaning (Critchley, 1970). It was not until 1683 that Thomas

Willis reported on the implication of language rather than speech, in aphasia. In a case study of an aphasic patient Willis stated:

> He well understood his infirmity, knew his friends and relations, and others who came to visit him, but could hardly remember the names of any of them; and when he began to talk of any thing, he wanted words to express his mind. (Critchley, 1970, p. 56).

Despite Willis' insight into the involvement of language in aphasia, research continued to allude to "hesitations of the tongue" (Critchley, 1970). It took until the late 1700's for any widespread acceptance among linguists of the notion that aphasic impairments involve language rather than speech. However, by the late 1700's the medical community of the era had not accepted aphasia as a language related disorder. According to Critchley (1970), the next insightful observation was made in 1798 by Sir Alexander Crichton, physician to the Czar of Russia, who realized and reported that in many instances, loss of speech was due to neither lingual paralysis nor dementia, but involved a disturbance of memory for a specific symbol or character.

Most aphasiologists suggest that the single most important event in aphasia research occurred in 1861 following an address delivered to the Anthropological Society of Paris entitled "On the Seat of the Faculty of Language" (Critchley, 1970). In the audience that day was Paul Broca, one of the forefathers of aphasia research. Broca was so impressed with the presentation that he began investigating localization of brain function and associated language deficits. The work of Broca and others concluded that a speech center was located in the brain. The bulk of research over the next 50 years continued investigating the link between localization and language function. Still, agreement on the nature and location of damage resulting in aphasic symptoms appeared elusive. By the 1920's the controversy was still raging, and the existence of Broca's "speech centre" was still unsubstantiated. Thus, researchers continued to investigate the brain-language relationship. Critchley (1970) cites Henry Head as being influential during the twenties. A

prominent aphasia researcher of the day, Head clearly rejected Broca's notion of localization of brain function. Like Hughlings Jackson, another prominent researcher of the time, Head observed great inconsistencies in aphasics performance and attributed these to severity of lesion rather than location of lesion. Consequently he introduced the first classifications of aphasia: verbal aphasia, nominal aphasia, syntactical aphasia, and semantic aphasia, terms which still appear in the contemporary research of the 1980's. Head suggested that seldom could any one individual be classified solely on the basis of one of these designations, as overlap of symptomology is great. Head was also the first to address directly the "process" operating within the language system of the aphasic. He spoke of schemata as the response of an organism to a stimulus dependent upon the arrangement of preceding responses, and proceeding responses, already organized, but outside conscious awareness. This was one of the first references to language as being ordered and responsive to one's environment. Related to this was Head's notion of vigilance, which was somewhat similar to "attention," or what today is termed a feedback loop (Critchley, 1970). Thus, here were the first suggestions of language being a dynamic process, sensitive to both internal and external stimuli.

Head made remarkable inroads into aphasia research. Despite the fact that his classification system was virtually undefinable he was able to gain wide acceptance regarding the notion of language involvement in aphasia (Critchley, 1970). Still unanswered, however, were questions pertaining to how aphasia should be classified and more generally, how the brain functions. These questions over the years have been the impetus for extensive study. Schuell (1974) stated that aphasia rehabilitation depends on what one thinks aphasia is. That, in turn, must be viewed in relation to brain organization and function, and not as something independent from organization and function.

Theories of Brain Organization

Though little consistency can be found in historical accounts of aphasia and brain function, Schuell (1974) cited three distinct theories which can be identified and which

occurred sequentially; Associationism, Field Theory, and Functional Equivalence. Each theory tended to emerge as a reaction against the preceding one. Thus, these three theoretical positions generated virtually the entire continuum of research carried out since the late 1800's.

Associationism

The work of Broca (1861) and of Fritsch and Hitzig (1870) formed the base upon which associationism theory was founded. A strict associationist view is one in which specific cells, endowed by nature for a specific function can be identified, as can their exact location in the brain. Critics of associationism however, cited serious methodological shortcomings in the selection and use of research techniques which resulted in a decline of acceptance of this theoretical position. Modern neurosurgery and related research by Wilder Penfield (1959) have resulted in strong evidence against a strict localization theory. It is therefore no longer accepted in its original strict interpretation, although some aspects of an interpretation are evident in medical practice today.

Field Theory

Field theory, or the theory of equipotentiality as it is also termed, was developed by various Gestalt psychologists who focused on the study of perception (Schuell, 1974). The theory contends that cerebral "regions" or "areas," rather than specific sites, are responsible for brain function. As Goldstein (1939) stated,

> Localization of performance no longer means to us an excitation in a certain place, but a dynamic process which occurs in the entire nervous system, even in the whole organism, and which has a definite configuration for each performance (p. 260-261).

Historically, field theory emerged as a reaction against the strict localizationist views. At no time, however, has conclusive evidence been offered to support this equipotentiality perspective (Schuell, 1974).

Theories such as field theories, are based on little in the way of empirical evidence. Therefore they tend to be less influential or accepted today than do those offering hard

evidence. Moreover, as computer and medical technology develops, an alternate theory to that of brain organization must be persued. The third theoretical position to be considered at this time, grounded by the new technology, is one which has recently gained increased support and acceptance.

Functional Equivalence

The research completed in the area of aphasia over the course of history has been framed around the accepted theory of brain organization of that time. Localization theory espoused specific sites of the brain as being responsible for a specific function, therefore damage to a specific area of the organ would have fairly predictable results. On the other end of the continuum, the field theorists adopted more of a Gestalt perspective, but offered little in the way of hard scientific evidence supporting their "areas" or "regions" of functioning. Between these two poles emerged the functional equivalent theories, led by Penfield and Roberts (1959). Their theoretical basis originated in neurology and neurosurgery. Hebb (1949) and Penfield and Roberts (1959) proposed the idea of limited localization, referring to regions which are functionally related. This suggests that rather than one specific brain area being responsible for a given brain function, that several areas share responsibility in functioning. Today, functional equivalence theory is still considered to be a more palatable, reasonable compromise.

In keeping with the functional equivalence theoretical perspective, it is interesting to consider in greater depth the work of Penfield and Roberts (1959) as it relates to speech and language functioning. Penfield, a neurosurgeon, undertook the challenge of mapping brain function using electrical stimulation. In 1959 he and Roberts published "Speech and Brain Mechanisms," which included pictures of mapped cortical areas. They identified three major areas of the brain considered important for speech and language. Two of these were previously known as Wernicke's area and Broca's area, both of which are located in the posterior temporoparietal region of the brain. The third area, located within the midsaggital fissure had not previously been implicated with speech and language

functioning. It was termed the supplementary motor area. Penfield and Roberts suggested that although the supplementary motor area was the most dispensible of the three, lesions to it could result in prolonged aphasia.

Penfield and Roberts (1959) also identified three types of memory which are crucial to language functioning. These are (a) experiential memory, (b) conceptual memory and (c) word memory. Experiential memory is considered to be a neuronal record of all conscious thought and experience. Conceptual memory is a collection of all experiences and generalizations that in turn produce a neuronal record of concepts. Word memory, which is the most closely related to word retrieval deficits in aphasia, is the product of a specialized mechanism in the brain which preserves each word form in the following manner; a ganglionic equivalent of a word is formed within the brain. This ganglionic equivalent of the word, according to Penfield and Roberts, eventually becomes reflexively connected with a similar ganglionic equivalent of a concept, and is continually reinforced over the life span through use. Thus, they saw this relationship between the two ganglionic equivalents as being a conditioned reflex. Penfield and Roberts felt that the conditioned reflex notion explains aphasia characteristics. When, for example, an individual wishes to speak, as soon as the idea (concept) is present, the word is reflexively provided and the message is uttered. Aphasia, is a disruption of that reflexive mechanism, a lack of continuity between the conceptual memory and the word memory.

Historically, the three primary theories of brain organization; associationism, field theory and functional equivalence emerged with the hope of providing new insight into brain organization and functioning. As new technological advances in neurology and neurosurgery emerged, the three aforementioned theories all experienced a decline in popularity and acceptance. With the same technological advances, newer, more contemporary and empirically based theories were introduced. As a result, an aphasia classification was born, which is still utilized to this day. Popular thinking in the area of aphasia soon began to be framed within the context of the typing system.

Contemporary Views of Aphasia

In an attempt to clearly understand word retrieval, more current thinking on brain and language functioning must be considered. Schuell (1974) defined aphasia as a language deficit which crosses all language modalities. It may or may not be complicated by other behaviors resulting from brain damage. Considering the skills necessary for effective communication, Schuell has, like her colleagues of the 1970's and 1980's, taken a process oriented approach to understanding aphasia. She cites three specific processes as being critical in aphasic disruptions. The first of these is auditory processing. It is generally accepted that humans learn language through listening to it. If for some reason that ability to listen and receive auditory information with its full integrity is deficient, several things can occur. There will be, according to Schuell, some impairment of the ability to understand spoken language. More specifically, reduced auditory retention span and possible auditory discrimination difficulties may be observed. Verbal attention span may be reduced as well.

Similar difficulties can emerge with visual processing (Schuell, 1974). Visual difficulties may include deficiencies, in visual discrimination, with the individual being unable to differentiate structurally similar words. There may also be concomitant deficits in visual field, spatial disorientation or even one-sided neglect. The aforementioned deficits all fall within the realm of visual processing.

A third process vulnerable in aphasia is the sensorimotor processing (Schuell, 1974). Disturbance of the sensorimotor processing system may involve reduced proprioceptive feedback, and can be manifested in inconsistent articulation errors. Sensorimotor processing relates more directly to motor speech than it does to language but is frequently present as a symptom in many aphasics. Understandably, then, damage to the sensorimotor processing can affect motor speech skills. Dysarthria and apraxia can be explained using a sensorimotor framework, as they are both motor speech disorders

associated with brain damage. Both apraxia and dysarthria involve reduced proprioception and motor planning abilities.

Schuell (1974), in discussion of these characteristics associated with sensorimotor processing of associationism, field theory or functional equivalence, is quick to point out that in no way do they support either the classical categories nor the more recent categories of aphasia. In relation to the need for a more recent categorization scheme, Schuell states that speaking of expressive, receptive, aphasia is meaningless, as all aphasia involves both receptive and expressive skills.

Word retrieval deficits are closely tied to Schuell's notion of auditory processing, as well as to memory or access to memory. How does this fit into the current understanding of aphasia as a whole? To answer this question, one must consider what has occurred in relation to aphasia categorization since Schuell's writings. Frequently, in the 1980's, terms such as Wernicke's aphasia, conduction aphasia, global aphasia, mixed aphasia, mixed-nonfluent aphasia, jargon aphasia, transcortical sensory aphasia appear in the literature when referring to various forms of aphasia and aphasia research (Reinvang, 1985). For the purposes of this paper it is not necessary to delve into each of these categories of aphasia in any depth. However, to clarify the organizational system used in aphasia diagnosis today, each category will be briefly discussed.

Brookshire (1978) described Broca's aphasia as motor speech aphasia, in which the speech of the patient is non-fluent and halting, with misarticulations common. The utterances of such an individual tend to be telegraphic, omitting non-essential parts of speech. This type of aphasia is in sharp contrast to that named Wernicke's aphasia, described by Brookshire (1978), in which the speech of the individual is usually quite fluent, except for pauses caused by the inability to retrieve the desired word. Though the speech mechanics or articulation appear intact, the content or meaning of what is being said is lacking. Brookshire (1978) refers to this as "empty speech." In these two types of aphasics, poor auditory comprehension is also noted.

Conduction aphasia refers to a condition in which auditory comprehension is relatively intact, but the individual cannot repeat anything he has just heard. The connection between the auditory areas and the area for the planning and execution of motor speech movements has been interrupted. Transcortical motor aphasia, unlike conduction aphasia refers to a condition in which the individual can imitate what has been said to him, but does so pathologically. This repetition of verbalization is considered "echolalic" as it is virtually involuntary. Most of the verbalization of this patient is also considered to be "empty speech," (Brookshire, 1978).

These aforementioned categories comprise the majority of aphasia types encountered. There exist additional categories of more obscure, uncommon types, however their descriptions are not essential to this present discussion.

One final aphasia type which is essential to this discussion has been termed anomic, related to the inability to name an object. Individuals diagnosed as having anomic aphasia typically possess high auditory comprehension and high verbal repetition ability. It is in naming of nouns that their skills are low. The inclusion of anomic aphasia into aphasia typology would appear to encompass word finding or word retrieval deficits. However, this is not the case. Sundet and Engvik (1984) stated that only 2% of aphasics could be termed anomic aphasics. Schuell (1974) reported that word retrieval deficits are present in all types of aphasics, and that word retrieval has been the most common target of aphasia treatment. It would appear that word retrieval deficits are not always a pure aphasia type as the categorization scheme would indicate. Rather, word retrieval is a characteristic occuring across aphasia typology and varying in severity with the degree of cortical insult. Within most of the contemporary views on aphasia is the premise that damage to one or more of the language "areas" of the brain impairs language functioning, however "related" areas take over some of the function for which the now damaged area was previously responsible. Rehabilitation is thus seen as building new pathways. Through the use of

techniques such as cueing (Schuell, 1974) the brain damaged person is instructed regarding how to access and use the newly established cortical pathways.

At this point it is interesting to consider a model which does not follow the process approach to understanding language dysfunction. Yeudall (1985) developed a theory of brain function as it related to dysfluent speakers. He outlined a general language functioning model which differs considerably from the mainstream theories. In Yeudall's model, information received from the senses (except olfaction) is relayed through the brain stem into the posterior association areas in both hemispheres. At the midbrain and thalamic levels differential weighting occurs, resulting in information being "gated," depending upon the nature of the information, to one or the other hemisphere. The incoming information is continually being processed within the memory system, while simultaneously interacting with other brain structures which serve a regulatory role (limbic system, basal ganglia etc.). In this way the amount of information reaching any cortical area is controlled. Yeudall believes that any subjective difficulties with the receptive component of language, or in the retrieval of information from memory, or in the flow of thoughts which one may wish to express, can be adequately explained by this model. Structures involved in the maintenance or cessation of fluent speech at a cortical level include the inferior frontal regions, Broca's area and the supplementary motor area of the dominant hemisphere. Subcortically, the basal ganglia, thalamic nuclei, cerebellum and midbrain are involved. These subcortical areas are interconnected and hierarchically connected to the limbic system and to the motor speech nuclei of the brain stem. Importantly, they include neural feedback and feed forward systems which directly control speech output. A disruption in the feed forward system could modify incoming auditory information by abnormally biasing the "thalamic gates" to the non-dominant hemisphere. Moreover, in an attempt to maintain and control speech there must be a dynamic interaction and balance between hemispheres.

Yeudall's model (1985) considers the processing of incoming information. However, in his view, the thalamus also controls expressive vocalization by opening or closing the thalamic gates to allow information in and out of the system. He states that the anterior thalamus specifically operates as a vocalization output "routing" gate from the two hemispheres (See Figure 1).

How does Yeudall's model relate to aphasia? In individuals for which the retrieval of information from memory is not a problem, the cortical and subcortical structures involved are intact, and the thalamic gates are normal. It is reasonable to assume then, that the converse is also true. That is, in individuals who experience retrieval difficulties, the thalamic gates may well not be opening and closing as they should, to allow input and access to information. This presumably results from damaged or at least disrupted subcortical and/or cortical functioning. It is subsequently suggested by this model that retrieval from memory is at least partially dependent upon proper functioning of the thalamic gate.

This puts a completely different perspective on traditional conceptualizations of aphasic systems. Implications of Yeudall's (1985) model for current techniques in rehabilitation of speech and language deficits of the CVA will be addressed later, but two areas must be discussed immediately. These are 1) word retrieval in relation to memory and theories of memory organization, and 2) the nature of cueing systems and prompts used to facilitate word retrieval.

Word Retrieval, in Relation to Memory and Cueing

The majority of research in word retrieval, memory and cueing has dealt with individuals whose aphasia resulted from stroke, in comparison to various populations which include Korsakoff amnesics and closed head trauma individuals. Each of the studies attempted to determine, in some manner, the relationship between memory, retrieval and "word finding" (naming) difficulties, in addition to the effectiveness of various cueing systems.

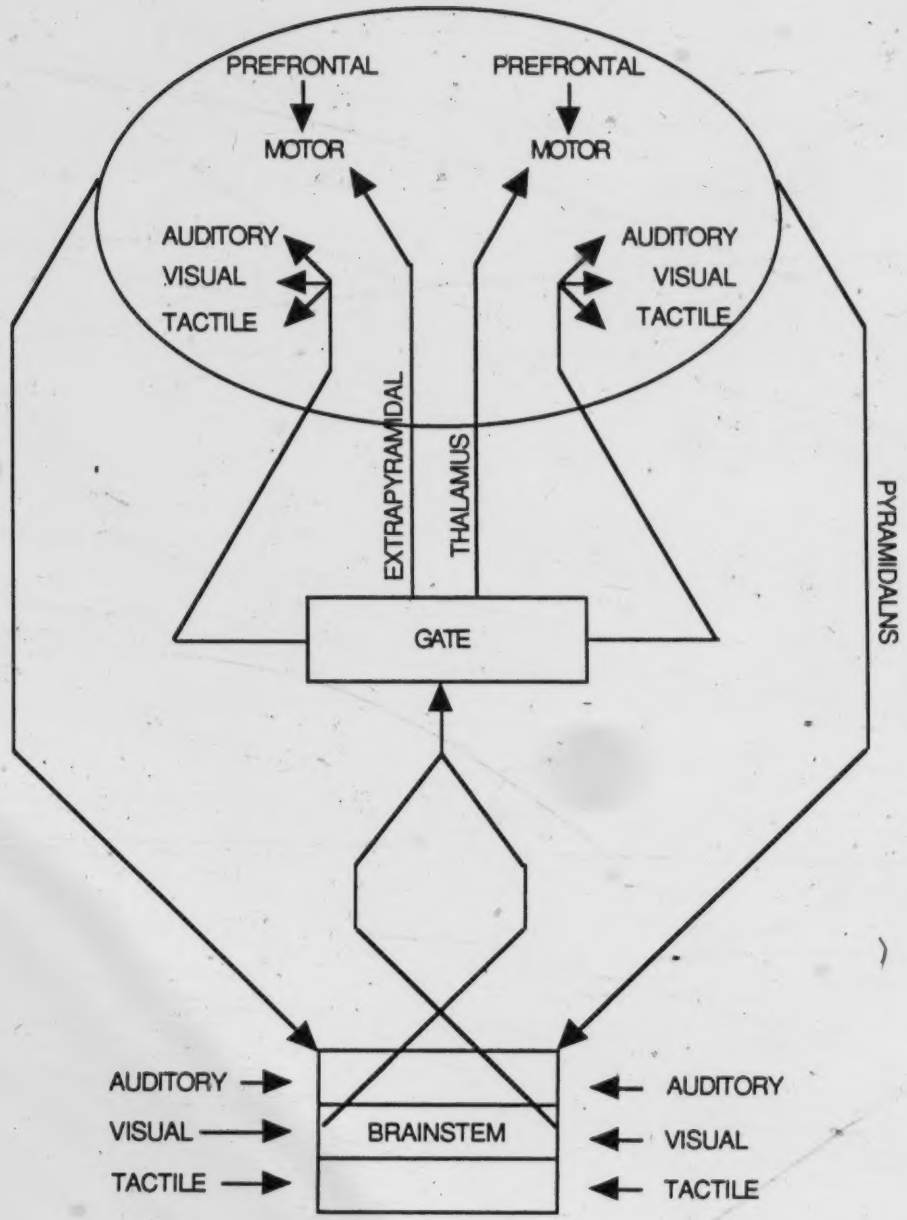


FIGURE 1
Adapted from Yeudall (1985)

Word finding deficits have been investigated using three primary testing procedures. Barton, Maruszewski and Urrea (1969) advocated the use of open ended sentences or sentence completion tasks, picture naming (also referred to as confrontation naming), and naming in response to a description. Through their research, Barton et al. concluded that the diagnosis of word finding performance was a function of which of the three aforementioned testing procedure was utilized. For example, picture naming tests the ability to label a picture. This involves "fed in" information through an intact visual system. Thus the individual must process the visual stimulus, associate it with a verbal label, and produce the picture name. The inability to do so is not the function of faulty visual skills, rather it is the inability to retrieve the label within the memory system. This is not to say that visual agnosia cannot exist, but that the lack of naming due to agnosia (the inability to recognize a stimulus) is not considered to be word finding. The picture naming procedure is a different task than the self-generated extended discourse typical of everyday conversation, as there is no "fed in" information in extended discourse coming through an intact channel. The only visual cues one gets during extended discourse may be body language and facial gesture, both of which are language systems and both of which are likely impaired in the aphasic (Kohn and Goodglass, 1985). The differences between the two tasks, confrontation picture naming and conversation, illustrates the pragmatic weakness of the picture naming technique. In the case of testing techniques such as sentence completion and open ended sentences, little visual cueing occurs; rather, auditory association appears to be the process upon which the rationale is based, even though it is known that the auditory system itself may be impaired. The weakness of the testing procedure is again exemplified.

The types of cueing systems utilized when trying to reduce word retrieval difficulty once they have been identified by one of the testing techniques, have relied either upon semantic association or phonemic prompts. Sentence completion, descriptions and the use of opposites are frequently used when employing a semantic approach to remediation.

Phonemic cueing uses first phoneme prompts or rhyming words to reduce the word retrieval difficulty. Since this proposed study considers the efficacy of using various cueing techniques, it is necessary to consider theory and research pertaining to not only the nature of cueing but also the "construction" of the language-memory system from which the word finding problems emerge.

Semantic Organization of Memory

Keeping in mind that no definitive model of either memory or language functioning exists, the relationship between semantic and phonemic cueing remains somewhat obscure. In an attempt to provide some clarity in the memory area, Collins and Loftus (1975) proposed a model of spreading activation of memory. They hypothesized that memory could be envisioned as a semantic network, organized on the basis of links and nodes, with increasing numbers of links between items of increasing similarity. They stated that "names" of word concepts are stored in a lexical dictionary which is based on phonemic similarity. Therefore priming can be either semantic, which would activate the semantic network, or phonemic, tapping in on the lexical dictionary. Through their research, they concluded that both category priming (association) and first letter priming are effective in eliciting concept names in normal subjects.

The Collins and Loftus (1975) model of memory is based on earlier models of semantic memory. This activation theory is supported by Milberg and Blumstein (1981) who studied a variety of aphasia types using a lexical decision task. They concluded, like Collins and Loftus, that automatic activation of memory occurs and that problems in aphasia result not from the semantic system itself, but the access to that system, or in other words, retrieval. They felt that the semantic organization system of the aphasic is the same as for normals, but that the aphasic is unable to complete the metalinguistic judgements and to make conscious semantic decisions in assessing and operating on the semantic properties of the lexicon. They felt, therefore, that only associative cueing would facilitate naming in the aphasic subject.

Caramazza, Berndt and Brownell (1982) enlarged upon the semantic system referred to by Milberg and Blumstein. Caramazza et al. (1982) felt that "word finding" problems, as measured by picture naming, could be due to access rather than disruption of a semantic dictionary. They proposed that the steps required for a naming task included: (1) low level perceptual analysis which restricts initial search space for an internal description of an object; (2) use of semantic information to produce "semantically interpreted" components that work as input into a classification algorithm which is modality specific; (3) assignment to a category membership; (4) mapping onto lexical items for phonological and syntactical information; and (5) articulation. Therefore, word retrieval deficits could result from the inability to access the target word, even when the second component of the naming system is intact. Presumably, inaccessibility could result from failure to transfer from the semantic to the phonemic component as indicated in the previous five step sequence.

Gainotti, Cartomagno, Craca and Silveri (1986) shared this view. They considered the quality and accuracy of lexical decisions made by aphasics during classification activities, and conclusions similar to those drawn by Caramazza, Berndt and Brownell (1982) were generated. Utilizing a non-verbal Class Inclusion vs. Class Interaction task, the researchers hypothesized that an aphasic subject would perform with considerably less success on the Class Inclusion task if the deficit underlying the communicative abilities was truly a loss of stored information within the semantic system. Class Inclusion refers to a task in which all the stimuli belong to the same superordinate category. For example, "rabbit" would be stored with other animals within the semantic system. Class Interaction tasks include items within the semantic system which overlap superordinate categories. Therefore, "rabbit" could be stored with "Easter," "white" or any other categorical concept not directly within the semantic class of "animals."

Contrary to their prediction, Caramazza, Berndt and Brownell (1982) found that aphasics did more poorly on the Class Interaction tasks. This, in turn led the researchers to

suggest that it is not a disruption of the semantic system which creates the loss of label; rather, it results from a functional inability to analyze in linguistic terms the perceptual and functional properties of the desired target.

Koemeda-Lutz, Cohen and Meier (1987) supported the notion that semantic memory remains intact in aphasics. Again utilizing a categorization task, these researchers compared aphasics with brain damaged individuals. Their results supported the contention that the structure of semantic memory is not disrupted in aphasics. They did observe, however, that aphasics tend to have longer latencies of retrieval. Moreover, they found that verbal cues aided retrieval in aphasics only and not in the diffuse brain damaged individuals. Finally, they found no significant differences in the performance across aphasia subtypes to support the claim that the subtypes could be differentiated.

Still within a semantic perspective, Schlenck, Huber and Willmes (1987) offered an alternative hypothesis. They suggested that inability to access the desired word could be due to the utilization of the "prepairs." This implies that "prepairs" are "covert repairs," or corrections at the level of inner speech. Thus monitoring by an aphasic with reasonably good comprehension inhibits production of the word, and presumably results in a pause during which time the search for the correct word is reactivated. As with Koemeda-Lutz et al. (1982), Schlenck et al. (1987) observed no significant differences in performance across the subtypes of aphasia.

Caramazza and Berndt (1978), Geschwind, (1967), Grober, Perecman, Keller and Brown (1980), Grossman (1978), Zurif, Caramazza, Myerson and Galvin (1974), and Goodglass and Geschwind (1976) similarly supported this semantic organization view to word retrieval. This view of semantic organization however, is not without criticism. A great deal of research has dealt with the phonological aspects of memory and retrieval.

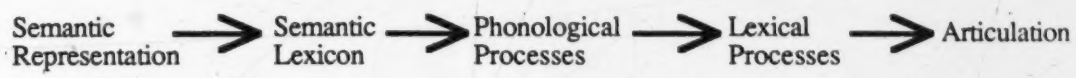
Phonological Organization of Memory

Thus far the studies reviewed have considered word retrieval deficits from a semantic perspective. Consider now, research providing support for a phonemic

perspective of memory. Cermak, Strassny, and Uhly (1984) used rhyme detection to investigate memory deficits in Korsakoff amnesics, aphasics and normal control subjects. Cermak et al. concluded that the aphasic's working memory is based upon phonemic recirculation. Frequently this phonemic process is impaired, whereas the semantic component of memory is merely slowed down. They hypothesized that no active phonemic trace can be made by the aphasic, thus upon viewing a picture or object, they should fail to construct a verbal label. Cermak et al. (1984) utilized recall and contrast of words and felt that the inability to contrast or recall words directly parallels "word finding" failure. Any semantic errors noted in the aphasic's language could be the result of the same underlying problem, that of being unable to store a word long enough to analyze it due to the absence of any phonemic trace. This concept appears similar to what other researchers have referred to as working memory or short term memory store. Cermak et al. (1984) concluded that "word finding" difficulties in aphasics are due to the inability to cognitively manipulate features of words, which results from impaired phonemic memory tracing and recirculation. This conclusion was in agreement with the findings of Saffran and Marin (1975), who also hypothesized the lack of cognitive manipulation as being at the root of word finding difficulties.

Butterworth, Howard, and McLoughlin (1984) felt that if anomia and presumably "word finding" in general are at a semantic level, then treatment utilizing phonemic concepts would prove futile. Additionally, they felt that using association (semantic) cues would only slow down the word retrieval process by creating a greater discriminatory demand on the system. Utilizing a comprehensive component which served to eliminate effects of word/concept loss as opposed to label loss only, Butterworth et al. (1984) stated that there is a strong relationship between semantic impairment and naming failure. However, aphasics were equally as likely to name pictures on which they had made specific comprehension (pointing) errors as those which were correctly identified. Clearly the deficit is not item specific; it is not due to permanent loss of individual words or

semantic information. The actual accessibility of the words may be varied unsystematically, resulting in the inaccessibility of the desired word. Butterworth et al. pointed to the importance of both auditory and articulatory processes in this phenomenon. In linear terms word retrieval processes were perceived in the following way:



Butterworth et al. (1984) believed this process was not modality specific. Duffy, Duffy and Pearson (1975) had stated some ten years earlier that the same retrieval processes described by Butterworth et al (1984) applied to gestural behavior as well as to verbal behavior in aphasia. By studying verbal and pantomime tasks Butterworth et al. (1984), like Duffy et al. (1975), concluded that the pathology is not specifically verbal but is one of overall functioning. In conclusion, they stated that if a common deficit underlies both comprehension and output in aphasia, then using semantic word discrimination practice could improve word finding more than simply working on the output using facilitating cueing strategies.

The belief one holds regarding the semantic or phonemic nature of memory storage not only affects remedial efforts. It also affects the theoretical nature of the memory structure - word retrieval relationship.

Memory Structure-Word Retrieval Relationships

The most recent research in memory structure tends to support the Collins and Loftus' (1975) notion of a semantic network which is conceptually organized, coupled with a lexical dictionary or network which is phonemically based. In relation to this notion, Bowles and Poon (1985) stated that it is the transfer of information from one network to the other which is at the root of word finding problems. Other researchers in agreement with Collins and Loffus (1975) and Bowlese and Poon (1985) are Weigel-Crump and

Koenigsknecht (1973), Baker Blumstein and Goodglass (1981), and Whitehouse, Caramazza, and Zurif (1978).

If one were to consider Bowles and Poon's (1985) hypothesis in relation to the process laid out by Nicholas, Obler, Albert and Goodglass (1985), it becomes evident just "where" in the system the deficit of naming exists. In Nicholas' et al. (1985) view any naming task involves these skills: (1) Perception, (2) Semantic Identification, (3) Retrieval of Label, (4) Encoding Articulatory Pattern, and (5) Correct Label. Clearly, if the Collins and Loftus (1975) notion is correct the deficit would lie between the second and third skill on the Nicholas' et al. (1985) list.

What is to be concluded from these studies? Many researchers point to a dual system of memory organization, comprised of a semantic and a phonological component. Frequently word finding problems appear to be related to a malfunction in the phonemic component or, more specifically, in the transfer from the semantic to the phonemic component. Most existing models consider this transfer in terms of a linear process rather than a parallel one, but neither the parallel nor the linear models are completely satisfactory when considering word retrieval deficits and cueing efficacy. Instead, these theories of memory organization fail to adequately deal with the one major problem which remains, and which therefore renders most models inadequate. The remaining problem relates to the considerable degree of inconsistency of retrieval observed in many CVA's. Thus far, no memory model can explain why inconsistency is present nor what can be done to minimize the variation.

Other Factors

Other factors including the response inconsistency, part of speech and the role of context must also be considered. The inconsistency of retrieval exhibited by stroke survivors poses problems in terms of both theory development and retraining efforts. Few researchers have addressed the question of why inconsistency occurs. Medin and Smith (1984) suggested that perhaps the "shut down" of the retrieval mechanism is not as

unpredictable and unsystematic as some believe. In their discussion of concepts and concept formation, Medin and Smith (1984) and Rosch and Mervis (1975) consider the roles of levels of linguistic/conceptual categories and the importance of "cue validity," or the closeness of resemblance a given word has to the cue offered to elicit it. For example, a superordinate category such as "furniture" has greater cue validity than does "table" when used to elicit the word "desk". Results of repeated testings illustrate that the more attributes an item has in common with other members of a category the greater cue validity it will possess. A word with high cue validity will have a greater degree of semantic knowledge attached to it, as it is closely related to many other "concepts". Thus Medin and Smith (1984) believe that cues of a superordinate category level are more effective than are simple exemplars. Moreover, superordinate categories are more easily retrieved as numerous semantic "associates" are available. It could be hypothesized from this, that phonemic cueing would be less effective in eliciting a category label than would a semantic or contextual cueing.

Flicker, Ferris, Crook and Bartus (1987) studied naming deficits in senile dementia and arrived at similar conclusions, as did Warrington (1975) and Martin and Fedio (1983). What the researchers found was that subjects have difficulty accessing information about specific attributes or other subordinate categories, whereas superordinate categorical information is readily available. Like Butterworth, Howard and McLoughlin (1984), Flicker et al. (1987) and Warrington et al. (1975) observed that the same individuals who could not provide a verbal label for an object could identify its visual representation.

Another factor believed to affect the functioning of the retrieval mechanism is the part of speech which is to be retrieved. Nicholas, Obler, Albert and Goodglass (1985) hypothesized that there are built in semantic cues in any sentence involving an action verb. In most cases these are contextual in nature. Nicolas et al. (1985) observed that the aphasic is more often likely to fail to retrieve nouns, as there is seldom a built-in semantic or contextual cue present. The failure to retrieve nouns or labels is characteristics of

"anomia". Word finding on the other hand can be any word, not merely a noun. Thus, word retrieval would be more influenced by contextual information.

Many researchers have considered the reasons for the discrepancy between noun-verb retrieval. In one such study by Williams and Canter (1987) four aphasia subtypes were considered in relation to proficiency in naming nouns and verbs. They concluded that the object naming task is easier because it represents a class of objects which are static. Verbs represent a class of objects undergoing change. Verbs are more abstract and unconstrained by the physical world, whereas nouns are "pointers" to objects that acquire built-in redundancy. Nicholas et al. (1985) considered verbs as influential to word finding rather than to anomia. In performance on tasks across the subtypes of aphasia, Williams and Canter (1987) found no differences.

A revealing study by Warrington and McCarthy (1987) completed a semantic analysis on one individual global aphasic. While they dealt primarily with comprehension skills, they suggested that access to storage is a construct comparable to comprehension, and that there exists a strict categorical organization of semantic information. They reported that fractionation takes place following a cortical lesion. For example, when considering concrete noun vocabulary, knowledge of "fruit" might be disrupted, however, knowledge of "animals" may be intact. They also hypothesized that patterns of fractionation would reflect the topographical or physiological organization of neural systems involved in information processing. If their hypothesis were ever proved, it would be virtually impossible to generalize any linguistic behavior across subjects, unless their patterns of semantic organization were similar. As well, the concept of "part of speech" would not be as critical, as organization of the type referred to in this study is more thematically based and not distinctly noun or verb organization. Thematic organization could involve many varied parts of speech. For example, the thematic category of "Instruments" could involve nouns (i.e., drum, clarinet), adjectives (woodwind, brass) as well as verbs (i.e., instruments for making music, for drafting, for surgery).

Pierce and DeStefano (1987) studied more specifically the role of context in word retrieval. Contrary to what Nicholas et al. (1985) postulated, Pierce and DeStefano (1987) found that aphasics were significantly worse at identifying a target word when the context was highly predictive than when the context was less predictive. This suggested that aphasics were more influenced by context than by any auditory signal they were receiving. In other words, the aphasics were unable to "block out" context.

Williams (1983) completed a review of the literature as it related to factors which influence naming performance in aphasia. It was suggested that a highly operative word (concrete), one which can be operated upon, has a higher chance of being retrieved than does a more figurative word (abstract). Semantic category was considered to be relevant as a factor in naming performance. Stimulus uncertainty, the consistency or inconsistency with which a particular name was used by normal subjects to label an item, was also influential. According to Williams (1983), low certainty words are more easily retrieved.

In terms of the actual verbal label, Williams (1983) cited the frequency of word usage and length of word as being significant factors in retrieval. The less frequently a word is used, and the longer and more phonetically complex it is, the less likely it is to be retrieved. In relation to the stimulus presentation, Williams (1983) noted that the sensory modality utilized is not crucial as all modalities are impaired in aphasics. Even so, in terms of retrieval, visual stimuli elicits the fastest reaction, followed by auditory, tactile, and olfactory stimuli.

Evident as well is that context difficulty plays a role in retrieval. Whether or not preceding items were correctly produced influences future naming performance, as does trial time. When a stimulus is presented for a longer period of time, greater is the likelihood of retrieval. Another factor which influences retrieval is the method used to elicit the target word; confrontation naming, sentence completion and naming to description all theoretically influence performance, as previously discussed. Though Williams (1983)

cited the type of cue utilized as significant, the evidence she collected for any one cue's superiority over another is contradictory.

Finally, Williams (1983) considered context. Again, contradictory evidence can be found. Citing her own research with Canter (1987), Williams indicated that highly contextual situations do not foster word retrieval. This is contrary to conclusions drawn by Nicholas, Obler, Albert and Goodglass (1985). Garratt and Jones (1987) stated that the more contextual information available, the less stimulus-related information is required for retrieval to occur, which again is in contrast to Williams and Canter (1987).

On the basis of this review it becomes clear that there exists little consensus as to the nature of word retrieval deficits, the intervening variables and their effects. How can the situation be summarized? In terms of the nature of the word retrieval deficit Kany and Ellis (1987) provided an interesting hypothesis. They suggested "types" of anomia, one semantic in nature, the other phonological. They also suggested two performance profiles which would separate the two types. If the impairment was at a semantic level, it would be manifested by: (1) failure or poor performance on semantic tasks, (2) improved naming with correct phonemic cueing, (3) no evidence of "tip-of-the-tongue" responses. "Tip of the tongue" is the experience which all speakers have at one time or another, where retrieval, though imminent, eludes the speaker for that moment.

An impairment at the phonological level would be characterized by: (1) good performance on semantic tasks, (2) weak effect of phonetic cues, (3) tip-of-the-tongue responses. A very interesting finding of the Kany and Ellis (1987) study related to phonemic miscueing for a semantic deficit (providing an incorrect phonemic cue), which resulted in significant naming performance improvement. In other words, even though the cue was misleading, retrieval still improved. This would lend support to the notion that the "type" of cue is unimportant - and that it is the extensive coaching which results in the final retrieval.

Brookshire (1983) tried to explain all of the contradictory evidence in aphasic research, and concluded that virtually all current research in the area fails to adequately describe the subjects of the experiment. Though recent studies suggest that "type" of aphasia is unimportant, Brookshire suggested that other characteristics must be documented including education, paresis, mood and sensory activity, only to name a few.

From this review of the literature pertaining to memory, word retrieval and cueing it is clear that there exist many concerns and questions which must be the focus of research. These include an adequate explanation of the inconsistency observed in the retrieval process, in addition to gaining a grasp on the role of part of speech, frequency of usage and phonemic complexity. The relationship between theory and remedial practices is a close one, and one which should ideally, be reciprocal. As remedial techniques and practices emerge out of the theory, they in turn serve to lend support or discredit the accuracy of the theory from which they emerged. The success or failure of any given remedial technique in educational or rehabilitative fields is under constant scrutiny, and accountability is foremost. This is the case with remedial techniques and practices aimed at reducing the effects of word retrieval deficits.

Efficacy of Therapeutic Approaches

The first factor one must consider in relation to the efficacy of current therapy aimed at reducing word retrieval deficits is that the likelihood of word retrieval problems being present in the absence of other language problems is minimal. Secondly, each therapy program tends to be "tailored" to an individual's deficits, thus it is difficult to compare treatment across subjects. In spite of this, there are some common techniques utilized by language therapists in an effort to facilitate word retrieval in the aphasic individual. These cueing techniques are termed in various ways, however, the following summarizes the core of them.

One method of eliciting a word is through sentence completion. This would resemble the form, "In order to tell time, we wear a _____". Upon using this

technique, Barton, Maruszewski and Urrea (1969) found no differences between naming performance in subjects utilizing sentence completion than when using no cue at all. It is reasonable to assume that this type of approach is based on the notion that the organization of linguistic memory is semantic in nature, as the cue being provided is semantic.

A second cueing technique is retrieval to a definitional statement (Davis, 1983). When using this technique Goodglass and Struss (1979) found no difference in naming performance compared to using no cue. An example of a definitional statement would resemble, "we wear it on our wrist, we tell time by it". This again, appears to be based on the premise that linguistic memory is semantifically organized. In both cases, Davis (1983), and Goodglass & Struss (1979), the evidence appears to contradict that assumption.

Another form of eliciting retrieval is free word association (Davis, 1983). In this technique the patient is asked to say the first word that pops into his mind in response to another word. This technique can also be termed verbal association, though the latter uses opposites, synonyms and rhyming words to foster retrieval. As in the previous two techniques, this also is based on the notion that memory is semantically organized.

Marshall (1976) classified the types of errors aphasics made in response to any of the cueing techniques. He found that semantic associations were most frequently produced, followed by description or extended circumlocution. Longer latency was evident in only higher functioning aphasics and, even then, infrequently. Closely related to this, Buckingham and Rekart (1979) identified five relationships between the erroneous response and the desired target word. These were: (1) synonym, (2) membership in the same category, (3) spatial contiguity, (4) instance of a category rather than the category and (5) description of the object. They concluded, on the basis of these observations, that most errors were qualitatively similar to "slips" made by normal speakers.

There is one final response type which must be examined, even though it is not technically classified as an "error". That is the neologism. A neologism is a fluently

spoken word which cannot be identified as belonging to the speaker's language. It may include the repetition of a syllable or sound (Davis, 1983). There is some evidence to support the notion that this type of error is indicative of a phonological realization that something is not working as it should. Buckingham (1979) states that neologisms are used to mask retrieval failures.

After considering the various eliciting types of techniques, the final controversy comes down to whether or not such techniques succeed in fostering word retrieval in aphasics. Moreover, do these techniques facilitate future word retrieval? If those individuals involved in such training do not eventually learn to cue themselves, does the technique really alleviate the problem to any functional degree? These are questions which must be considered when evaluating the efficacy of these therapeutic techniques. Holland (1975) stated that while no single study can "prove" the efficacy of treatment, reviews of the literature have yielded cautious to confident conclusions that therapy is effective. Duffy (1981) stated that such conclusions are invalid due to serious methodological shortcomings. Some of these shortcomings are related to Brookshire's (1983) displeasure with the lack of subject description in the current research. Others refer to the use of "clinical impression" rather than empirical evidence of success. Prins, Snow and Wagenaar (1978) reiterate these concerns about clinical research as follows: "The exact content of therapy sessions was highly variable, dependent upon the patient, the treatment centre and the speech therapist involved" (p. 208).

Shewan (1986) stated that when one looks at language therapy as a whole and refrains from comparing techniques the evidence weighs favorably in the direction of effectiveness. Shewan stated, however, that no conclusions can be drawn as to the superiority of one technique over another. The nature of the subject population is the primary reason for the lack of conclusions rather than poor research methodology being to blame.

So what is to be concluded? Is treatment effective but the nature of the treatment irrelevant? This would support the comments in the introduction of this paper pertaining to superstitious learning. Duffy (1981), however, feels that there is reason to be optimistic, and that very soon we will be able to adequately assess the efficacy of various techniques. This statement rests on five factors: commitment to accountability, flaws in previous techniques of evaluation, improved methods of study, more sensitive measuring instruments, and finally, a swing towards viewing treatment as a dynamic process.

Accountability and methodological improvements aside, there is a critical ethical dilemma which emerges. It is not, however, restricted to this one discussion. The far reaching dilemma referred to is that of utilizing a form of treatment or therapy which may or may not be an effective method of rehabilitating the individual who experiences pathological word retrieval difficulties. The effects of this dilemma are not limited to the patients themselves. Consider the dollars which are allocated for speech and language rehabilitation. In order for the professionals involved to become accountable, a serious look must be taken at the effectiveness of a treatment method which predominates in aphasia therapy.

Also of relevance are some of the "meta-strategies" now taught to the learning disabled population. Specifically, memory strategies are founded on knowing about the process of memory and what strategies to employ when difficulty is encountered. In terms of the learning disabled population one might argue that a comparison to CVA's is unfounded. But, while the etiology of the word retrieval problem may well be different, descriptions of "slow auditory retrieval" in learning disabled children are strikingly similar to that of aphasic behavior (Smith, 1983). Such terms as "poor access to linguistic information," "codes that mediate recall" are frequently used in the learning disabled literature. What techniques are employed to deal with this problem? Torgeson and Goldman (1977) stated that the inability to utilize verbal mediation is crucial; the child must be taught to talk oneself through the problem--to use verbal cues to retrieve the target word.

This is strikingly similar to techniques used by aphasics in an attempt to train semantic and phonetic self-cueing.

The point of this discussion is to illustrate that the problem being dealt with in this paper is not an obscure one, but is experienced by brain damaged, aphasic and possibly learning disabled populations. As well, word retrieval deficits can be observed in a variety of other language disordered populations including verbal autistic and psychiatric populations.

The question which must be addressed is not a simple one. It is a problem of complex dimensions, which must be considered not in isolation, but in an interactive manner. There exist numerous factors which must be taken into account. One must consider the historical roots of word retrieval deficit research and remain cognizant of the fact that it emerged from the aphasia literature, and that the aphasia literature is clearly troubled by methodological shortcomings. Remedial techniques aimed at reducing the effects of a word retrieval deficit tend to be based on a theoretical framework of brain organization and its relation to memory and language functioning. Debate continues as to the nature of the system involved in word retrieval processes. Both phonemic and semantic systems of memory organization have been postulated, however no evidence clearly supports one or the other, nor the superiority of one over the other.

The inconsistency of successful word retrieval is also a serious consideration. This harkens back to theories of brain organization and subsequent conclusions as to the operation of the system or systems involved in memory. Researchers have proposed possible variables which might account for this inconsistency of retrieval success, including the part of speech being elicited, context, word length, and level of abstraction to name only a few. The roles of these variables in word retrieval is unclear.

Finally, of concern to those individuals involved in remediation efforts is the success of techniques commonly used to reduce the effects of a word retrieval deficit. Whether or not various cueing techniques actually foster elicitation of a desired word is

unclear. It may be that the simple focusing of attention is equally successful in eliciting the desired word. Whether or not there exist individual differences and preferences related to cue type has not been adequately determined.

These are some of the more troublesome questions and concerns which arise from a review of this literature. As a result, this study will attempt to address the following:

1. For each subject: Does either phonemic or semantic cueing demonstrate superiority in enhancing word retrieval?
2. When phonemic complexity and word length are controlled, what is the relationship between type of cue, part of speech, and conceptual category of the desired word?
3. What factors, if any, lead to the inaccessability of a particular word when only seconds prior the retrieval process or mechanism was successfully accessing words?
4. For the subjects as a group: Does simple, indirect encouragement to retrieve result in enhanced retrieval, and, if so, to what degree?
5. What is the relationship between word retrieval observed in confrontation naming tasks versus that which is observed in extended discourse?
6. Is confrontation naming a reliable indicator of day to day word retrieval problems?
7. Does "cueing" the brain damaged individual aid in retrieval?

This study was designed to address these questions as they relate to widely published theoretical positions supporting the roles of phonemic versus semantic storage of linguistic information. Finally, the results of this study are considered in relation to existing models of brain organization and function.

CHAPTER 3

METHODS

This study investigated possible factors leading to or surrounding the failure of the retrieval mechanism to call up a given word. The nature of the target word was considered in relation to noun versus verb as well as to superordinate versus exemplar level of the label. Finally, all types of cues eliciting the desired word were considered. Semantic association, phonemic, non-directed cueing and no cueing conditions were employed.

Subjects

The performance of a sample of individuals who have suffered left hemisphere damage due to stroke and subsequently exhibit word retrieval difficulties was studied. To maximize homogeneity of the sample population, right handed individuals with no history of ever having been left hand dominant (therefore likely to be left hemisphere dominant) were selected. By utilizing stroke patients, problems involving more diffuse damage, as in the case of head trauma, could be minimized. As a result, even though the brain damaged population is heterogeneous, by selecting left hemisphere stroke victims, a greater degree of homogeneity, among a heterogeneous group was targeted. A total of 5 left hemisphere CVA's were identified as follows:

- demonstrating moderate word finding deficits as determined by the Category Naming Subtest of the Boston Aphasia Examination (Goodglass and Kaplan, 1972).
- level of comprehension sufficient to complete a one stage command
- intelligible speech
- no visual agnosia
- minimum grade nine (9 years of formal schooling)
- left hemisphere CVA - Right Handed
- had not received ongoing language therapy
- between 45 and 75 years of age

- minimum 1 year post onset
- first language was English

Subjects were identified on the basis of the results on the Category Naming Subtest of the Boston Diagnostic Aphasia Examination (Goodglass and Kaplan, 1972).

It was hypothesized that subjects meeting these criteria would (1) reside in extended care facilities or (2) reside outside such facilities but be receiving ongoing occupational therapy or physical therapy at these facilities on an outpatient basis. Therefore, recruitment of subjects involved the cooperation of occupational and physical therapists in the facilities. The degree of anticipated cooperation was investigated and openly welcomed by many staff. A list of subjects was created, however only those meeting the criteria of being moderately impaired in word finding as defined in the Boston Naming Test served as subjects.

The subjects who met all aspects of the criteria ranged in age from 45 to 75 years. All demonstrated the ability to follow a one step command and all had completed grade 12 education. Three subjects were males and two were females. All were asked to give informed consent to participate in the study and all complied with this request. All subjects were medically stable, and had suffered a left hemisphere CVA. All had been in a rehabilitation facility for 2 or more years. All subjects demonstrated adequate hearing and vision to complete the tasks.

Subject #1

Subject #1 was a white male, 67 years old and of Canadian desent. Prior to the stroke he had completed post secondary education and worked in the field of education. He had right sided paralysis of both his arm and leg and remained in a wheel chair.

Subject #2

Subject #2 was a 75 year old female of Dutch desent, however English was her only language. She had completed grade 12 and spent her life farming. She had paralysis of her right arm and leg and also remained in a wheel chair.

Subject #3

Subject #3 was a 63 year old male of British desent. He had completed high school and some further training, though the specifics of that training were unclear. It was established that he had been a white collar worker. He experienced paresis of his right arm and leg and was learning to use a walker.

Subject #4

Subject #4 was a 71 year old female of Ukranian desent. She knew both English and Ukranian, however English was her language of choice. She had completed grade 12, and had been a housewife and mother most of her life. She had paralysis of both right arm and leg and remained in a wheel chair.

Subject #5

Subject #5 was a 47 year old male of Asian desent, who spoke English as his first language. He had completed grade 12 and prior to his stroke had been a concert pianist. He had paralysis of both right arm and leg.

Variables

The dependent variables in this study were (1) word retrieval performance and (2) the latency of responding. Independent variables included (1) type of cue used to elicit a target word, (2) the part of speech of the target word, (3) conceptual category of the target word, and (4) context of the retrieval activity, namely confrontation naming versus extended discourse.

Materials

Target words in this experiment were limited to one or two syllables in length so as to control phonemic complexity (Williams, 1983), and were considered words of moderate frequency of occurrence in the English language. On the basis of these two criteria eighty words were randomly selected from the Word Frequency Book (Carroll, Davies, & Richman, 1971), as were pictures to match each word selected. There were 40 verbs and 40 nouns. Of the nouns, 20 were exemplar labels and 20 were superordinate nouns. The

pictures remained constant and were randomly arranged for Word Finding Tasks 1,2,4 and 5. Eighty stimulus cards which represented the 40 nouns and 40 verbs in a contextual setting were used for Word Finding Task 3. A stop watch was utilized to time the latency of retrieval for each picture presented to the subjects. Finally, an audio tape recorder was used to record responses.

Procedure

Subjects were tested utilizing five Word Finding Tasks, each involving the presentation of the 40 nouns and 40 verbs. Tasks included semantic association, phonemic, non-directed, and "no cueing" conditions. Each task was performed on an occasion 2 weeks separate from the next. The subjects were confronted on one further occasion with naming a contextual situation. During the confrontational naming task, the effects of context cues were examined. Each subject was tested individually. The subject was shown each picture one at a time. No feedback as to the accuracy of response was provided. Tasks were completed utilizing stimuli requiring retrieval of nouns (exemplars and category labels), and verbs.

It is unlikely that "learning" occurred during the first three testing sessions, sessions which involved "no cueing," indirect cueing, and extended discourse. The fourth and fifth testing sessions, involving semantic and phonemic cueing, were counterbalanced, as these are the only two tasks in which the risk of "learning" could arise. Thus, one half of the subjects encountered the semantic cueing condition as their fourth session, whereas the other half encountered the phonemic cueing condition as the fourth session.

Upon presentation of each picture the appropriate cue was delivered, at which time the stop-watch was started. Timing continued for each item until an answer had been provided which the subject had firmly decided upon discontinued searching, or until two minutes had expired. Timing was stopped even if the "decided upon," response was incorrect. Each response was recorded both in writing and on audio tape.

All five subjects were exposed to five sessions of word finding activities. For all subjects, the sessions took place in their rooms in their respective facility. Subjects 1,3,4,5, were all able to sit up in a wheel chair with the examiner sitting facing them. If a table was available, the examiner used this to keep stimulus cards on, however held each picture up in front of the subject during presentation. If no table was available, cards were placed on the floor, and held up during presentation. Subject #2 completed the activities while lying in bed with the examiner at her bedside.

Distractions during the sessions were curtailed as much as possible, but all subjects had roommates present during the sessions. All had one roommate except for Subject #2 who had 3 roommates.

Subjects #1, and 3 had regular visitors. visits were scheduled so as not to interfere with testing sessions. Subjects #2, 4 and 5 had few if any visitors, family or friends, therefore no special arrangements were necessary.

All subjects, or their guardian(s) were asked to give informed consent for participation in this study. Withdrawal from the study was guaranteed at any point should the Subject desire it.

Experimentation

Testing Session #1: No Cueing Condition

Instructions: "I'm going to show you some pictures. Look carefully at them and do your best to name the object or the action in the picture."
"Let's do a couple for practice".
(demonstrate desired response with 3 training items).

Eliciting: "Now let's begin. This is a picture of _____."

Phrase: "This is a picture of _____" was repeated every 20 seconds. This was continued through all 80 pictures.

Testing Session #2: Non-directed Cueing

Instructions: Same as #1.

Eliciting Phrase: "This is a picture of _____."

Cue: "Try really hard now."

"Try to name it again."

"Try again" was repeated every 20 seconds. This was continued through all 80 pictures.

Testing Session #3: Extended Discourse

*Activity pictures selected to elicit the 80 nouns and verbs tested on the two previous tasks will be presented one at a time. Responses will be audio recorded for later analysis.

Instructions: "Tell me a story about this picture".

Testing Session #4: Semantic Cueing

Instructions: Same as #1 and #2.

Eliciting Phrase: Semantic Association

Example: "I like peaches and _____."

This was repeated every 20 seconds throughout the presentation of all 80 pictures.

Testing Session #5: Phonemic Cueing

Instructions: "I'm going to show you some pictures and say a sentence. Look carefully at them and do your best to finish the sentence."

"Let's do a couple for practice".

(demonstrate desired response with 3 training items).

Eliciting Phrase: Phonemic Cue

"This is a "p" _____."

This was repeated every 20 seconds throughout the presentation of all 80 pictures.

All responses obtained during the five testing sessions were subsequently coded as belonging to one of the following response types:

a) incorrect but semantically related to target,

b) incorrect but phonemically related to target,

c) incorrect and unrelated to target,

d) correct, and

e) frustration, which is defined as any refusal to attempt retrieval, or verbal expression of displeasure with task. Statements similar to "I don't like this"
"I don't want to do it"
"I can't do this,"
would be considered examples of a frustration response.

Tallies were generated for each subject as to the number of responses in each of the response types. In addition, the total response latency for the retrieval of exemplar nouns, superordinate nouns and verbs was calculated for each cueing condition. The total latency time of all responses was calculated, as was the elapsed time from beginning to end of each session for each cueing condition.

The results will be discussed on a "Within Subject" and "Between Subject" basis. The response type will be considered in relation to cue type for each subject. The nature of correct responses will be considered in terms of exemplars, categories and verbs. Overall time expenditure in retrieval activities will be included in the analysis. Time of retrieval will be considered in more detail, as mean retrieval time for any item will be discussed in relation to exemplars, categories and verbs (linguistic class). Time distribution will also be considered in relation to linguistic class. These will be discussed for each subject and for each cue type on a within subject and a between subject basis. Finally the influence of frustration on accuracy and time of retrieval will be examined.

Recruitment of the subject population as per the methods section of this paper generated a significant amount of difficulty. Five subjects were initially recruited and

began their involvement in the research study. During this time, an additional five subjects were being sought. In the interim between running the initial five subjects and recruitment of the final five, criteria by which local Hospital Districts and Extended Care Centres allow access to their residents for research purposes was tightened considerably. Attempts to recruit the additional five subjects subsequently proved fruitless. Not only were local and surrounding area nursing homes, auxiliary hospitals, and Extended Care Centres contacted but, local Stroke Recovery Associations were also contacted. Acute care or rehabilitation hospitals were unable to provide any assistance, as their rule of confidentiality governs the disclosure of patient names. Thus, the only option left to gain access to this population was to submit an altered version of this study in an attempt to meet Hospital Districts' ethical and relevance standards. As a modified version would radically alter the nature of the study, this option was rejected.

It was decided, rather than alter the nature of the study, that a more qualitative study be done of the five subjects for which data had already been collected. The data from the five subjects will be analyzed as outlined. In the original proposal there was consideration given to the frustration experienced by the subjects during word retrieval. This frustration manifested itself in two primary behaviors. One of these was the refusal to even attempt to retrieve the target word; the other was a verbal expression of distress (e.g., "I know what it is but I can't remember the word"). Responses like these raised several interesting questions. Does frustration actually make retrieval of a target word less successful? Does the level of frustration change as the type of cueing changes, and does that vary from individual to individual? The availability of this type of information would have a significant impact on therapy delivery.

The ecological validity of such an examination of the data is clear, as the influence of the "metamemory" strategists emerges more and more frequently in the literature, illustrating the importance of enhancing memory ability. If frustration in fact plays either a

facilitating or inhibiting role in retrieval, this also has effects for normal individuals experiencing normally occuring retrieval difficulties.

The total of 2000 responses generated by the five subjects were analyzed as initially outlined. In addition, an analysis of the frustration factor was also included. Additional analysis for a more in-depth consideration of the preferences and cueing effectiveness as well as its possible interference in the retrieval process will be undertaken. Specifically, the number of expressions of frustration (either refusal or declaration of distress) will be compared across cueing types. Frustration will also be considered between and within subjects. The relationship between frustration and the effectiveness of "preferred cueing" for any individual will be addressed.

CHAPTER 4

RESULTS

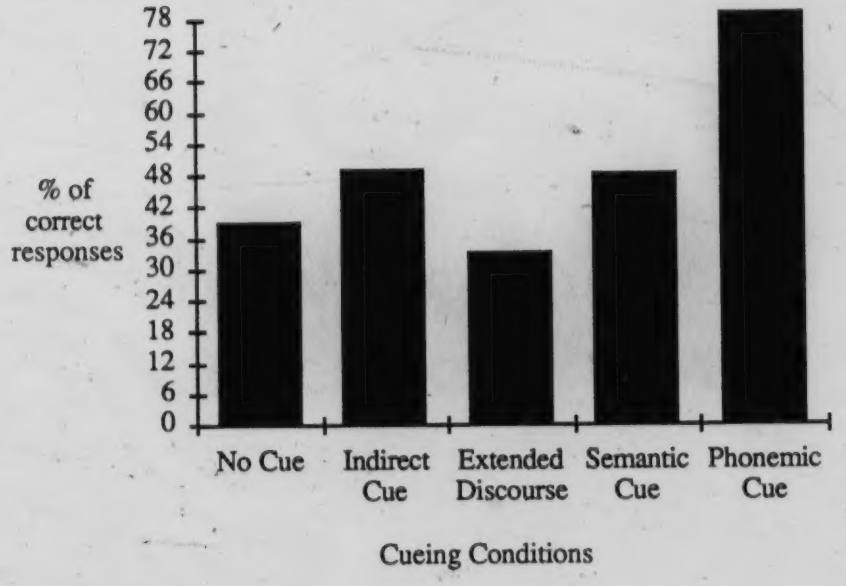
Within Subject Analysis

Subject #1

Figure 2 reveals the proportion of responses produced by Subject #1 across cueing conditions which were considered to be correct responses. "Phonemic cueing" clearly produced the greatest level of correct response at 78%. "Indirect cueing" and "semantic cueing" both produced an accuracy level of 48% less than half the total responses. "no cue" and "extended discourse" produced even fewer correct responses. The "extended discourse" appeared least successful in eliciting correct responses at 31%, meaning that 2/3 of the responses elicited during "extended discourse" were not correct.

FIGURE 2

Correct Responses x Cueing Conditions
Subject #1



Subject #1 produced low numbers of incorrect but phonemically related responses across conditions. With one or two exceptions, the cueing conditions in general, produced higher levels of semantically related responses relative to phonemically related, incorrect-unrelated or frustrated responses. Frustration was evident during "semantic cueing", with 10% of responses being discontinued due to frustration. Frustration was also noted during "phonemic cueing." It was negligible in the three remaining cueing conditions (See Figure 3).

Figure 4 considers more carefully the nature of the correct responses produced by Subject #1. It is clear from the Figure, that Subject #1 had less success retrieving categories as compared to either exemplars or verbs. The reduced level of correct category retrieval appears consistent across cue conditions.

With the exception of "phonemic cueing" correct exemplar retrieval and verb retrieval were quite similar, both relative to each other and relative to the cue conditions. "Phonemic cueing" however, produced a higher proportion of correct verb retrieval than any of the other cue conditions. Fifty-two percent of Subject #2's correct responses during the "phonemic cue" condition were verbs.

Figure 5 illustrates the total amount of time spent in retrieval activities across cueing conditions. It can be seen that the "phonemic cue" condition was most economical in terms of retrieval time, followed closely by "semantic cueing." Somewhat less efficient regarding time consumed in retrieval were the "indirect cue," "extended discourse" and "no cue" conditions in that order. Such findings suggest that the "directness" of the cue used to direct the word search influenced the rapidity of the retrieval for Subject #1.

In all but one instance, Subject #1 spent less time per item retrieving exemplars than either categories of verbs. Figure 6 illustrates that the quicker retrieval of exemplars was consistent across cue conditions with the exception of "extended discourse." In relation to verb and category retrieval, Subject #1 was inconsistent in relation to the amount of time spent retrieving each individual item.

FIGURE 3

Phonemically Related, Semantically Related, Incorrect, and Frustrated Responses Across Cueing Conditions Subject #1

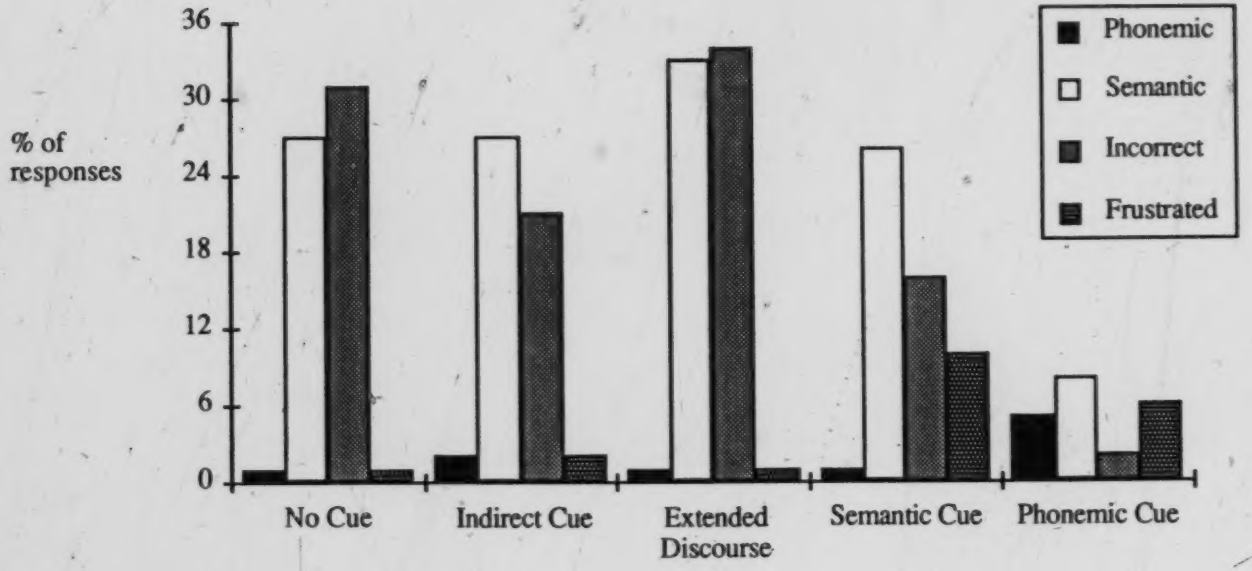


FIGURE 4

Distribution of % Correct - Linguistic Class Across Cueing Conditions
Subject #1

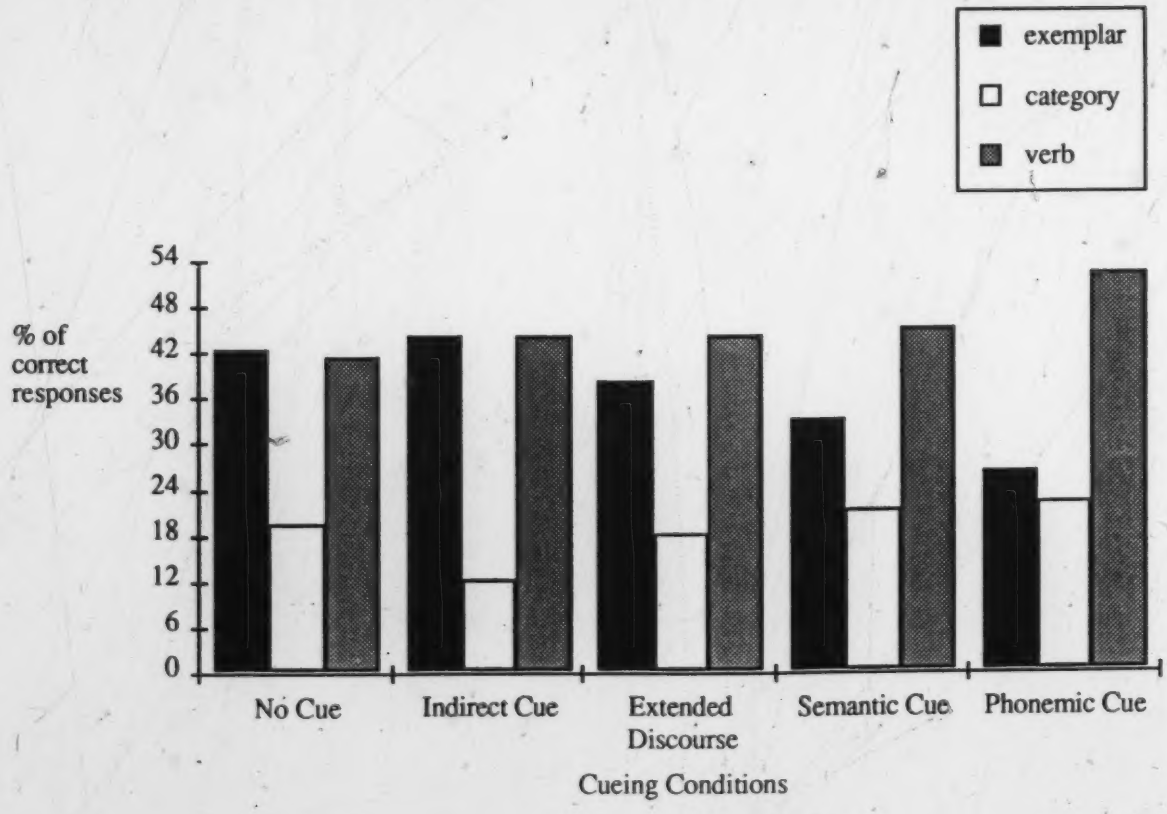


FIGURE 5

Total Retrieval Time x Cueing Conditions
Subject #1

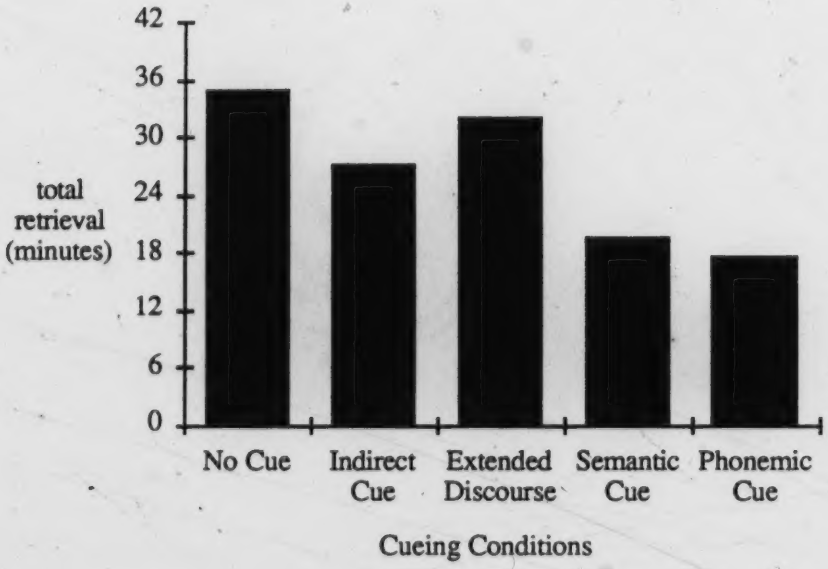
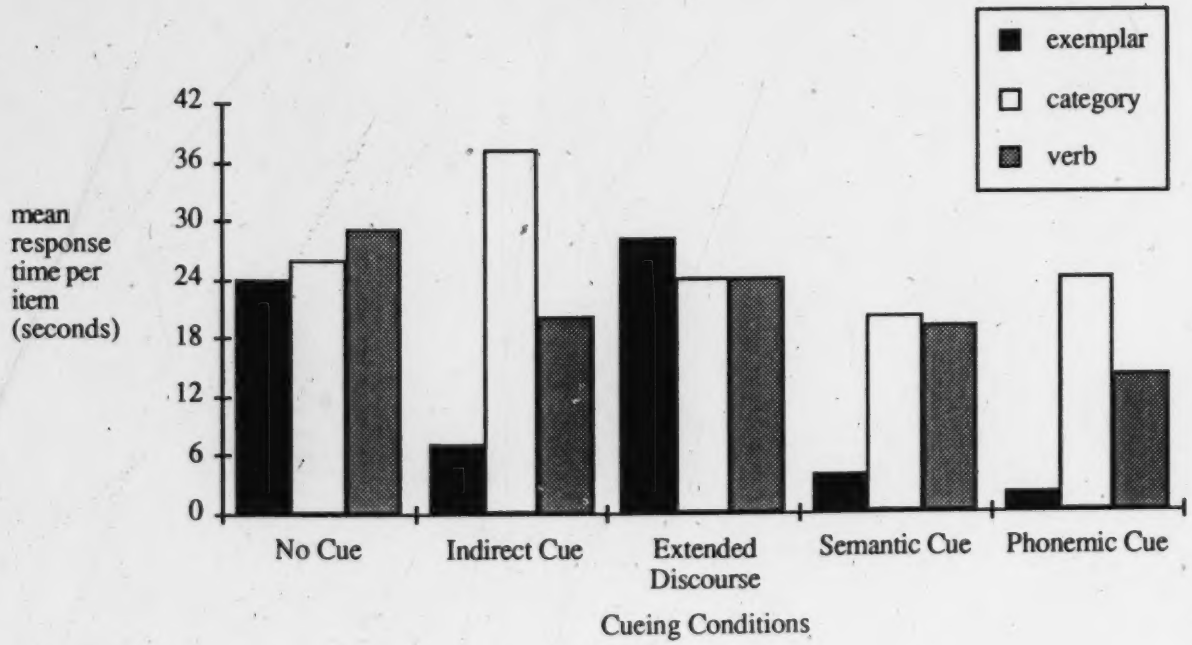


FIGURE 6

Mean Retrieval Time - Linguistic Class Across Cueing Conditions
Subject #1



The time spent on retrieving categories, exemplars and verbs during "extended discourse" was fairly similar, suggesting that the additional information provided by contextual cues generally slowed down retrieval of all three linguistic classes.

Figure 7 considers the proportions of total time spent in retrieval activities in relation to the three linguistic classes of exemplar, category and verb. Given that verbs constituted 50% of the stimuli during the study, categories 25% and exemplars 25%, it can be predicted, using simple mathematics that the time proportions spent retrieving each linguistic class would be equal to the 50%, 25% and 25% distribution. Such was not the case for Subject #1. Considerably more than the predicted 25% of the total time was spent on category retrieval for "indirect," "semantic" and "phonemic" cueing conditions. Perhaps the information provided by these cues enabled Subject #1 to utilize otherwise disrupted higher level semantic strategies, thus increasing the time required to make the necessary linguistic analysis.

The proportion of time required to retrieve exemplars was typically at or below the expected 25% level. This is based on mathematical calculations explained previously. The proportion of overall time spent in the retrieval of verbs hovered within 10% of the expected 50% level across all conditions.

Subject #2

Figure 8 depicts the proportion of correct responses elicited across conditions for Subject #2. From this figure, it is evident that cueing increased the number of correct responses produced. "Phonemic cueing" produced an accuracy level of 69% followed by "semantic cueing" at 63%, "indirect cueing" at 55%, "extended discourse" at 54% and "no cue" at 49%.

The remaining incorrect responses have been divided into incorrect but phonemically related to the target word, incorrect but semantically related to the target word, incorrect and unrelated to the target word, and discontinued responses due to frustration. Figure 9 depicts these responses. Subject #2 produced no examples of

FIGURE 7

Proportion of Total Retrieval Time - Linguistic Class x Cueing Conditions
Subject #1

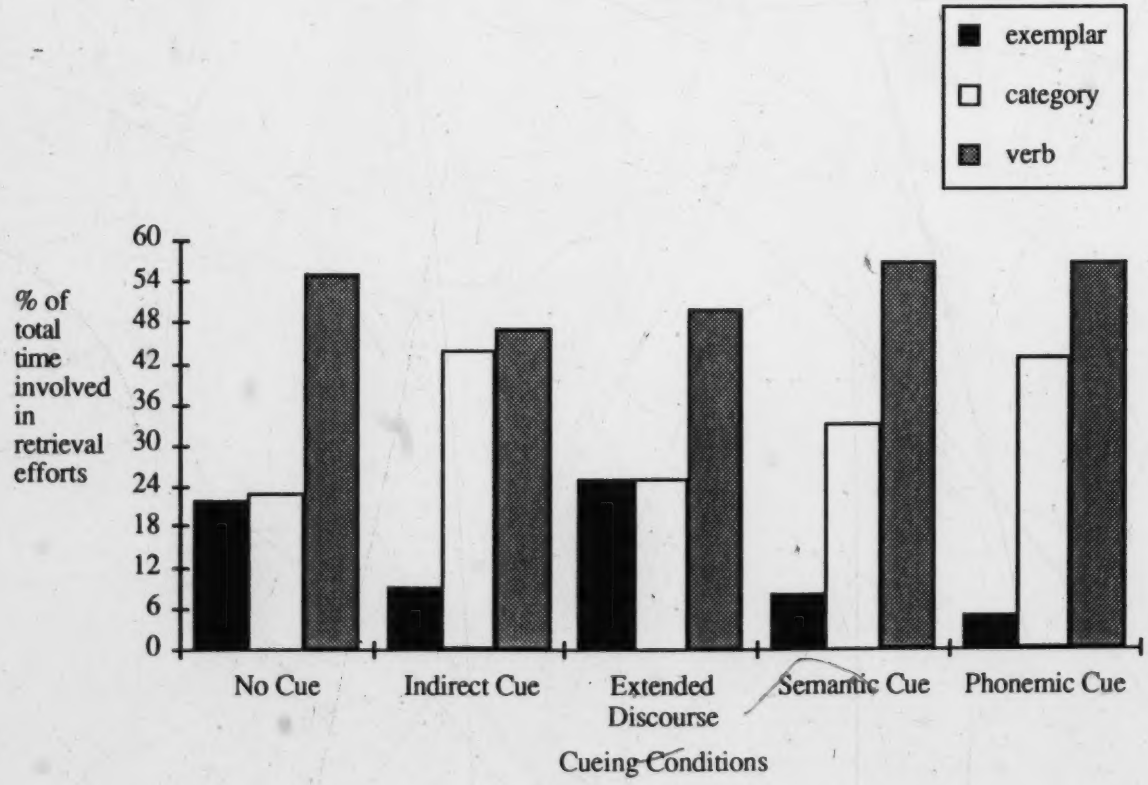
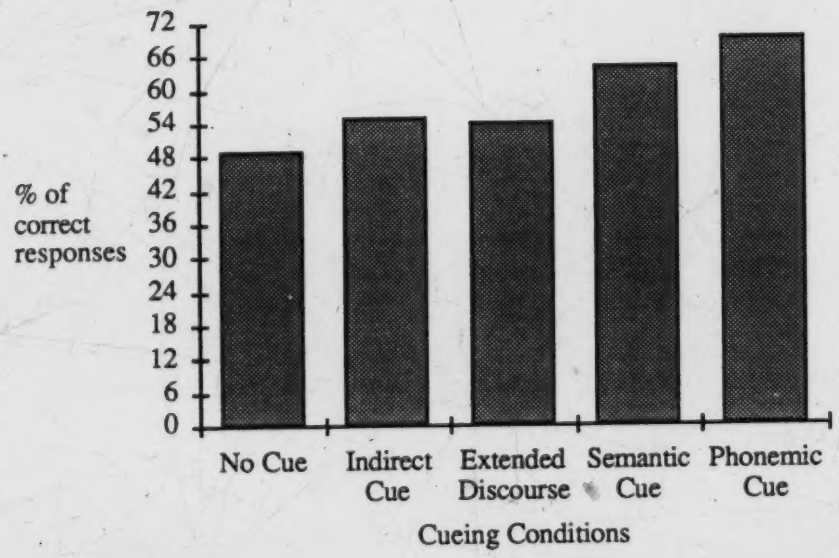


FIGURE 8

Correct Responses x Cueing Conditions
Subject #2



phonemicaliy related responses during any of the conditions. The proportion of semantically related responses exceeded the level of incorrect unrelated responses across conditions. Subject #2 experienced the greatest degree of frustration during the "no cue" condition suggesting that even indirect focusing of the word search was viewed as helpful by Subject #2.

In relation to the linguistic class of correct responses produced by Subject #2, several observations can be made. With "no cue," this subject was most successful retrieving exemplars with 41% of all correct responses produced during the "no cue" condition being exemplars. The level of successful exemplar retrieval decreased with the remaining cue conditions. Verbs tended to increase in representative proportion of the correct responses. This was most evident in the "extended discourse" and "phonemic cue" conditions. Typically, categories comprised the smallest proportion of overall correct responses produced by Subject #2 across conditions.

FIGURE 9

Phonemically Related, Semantically Related, Incorrect and Frustrated Responses Across Cueing Conditions
Subject #2

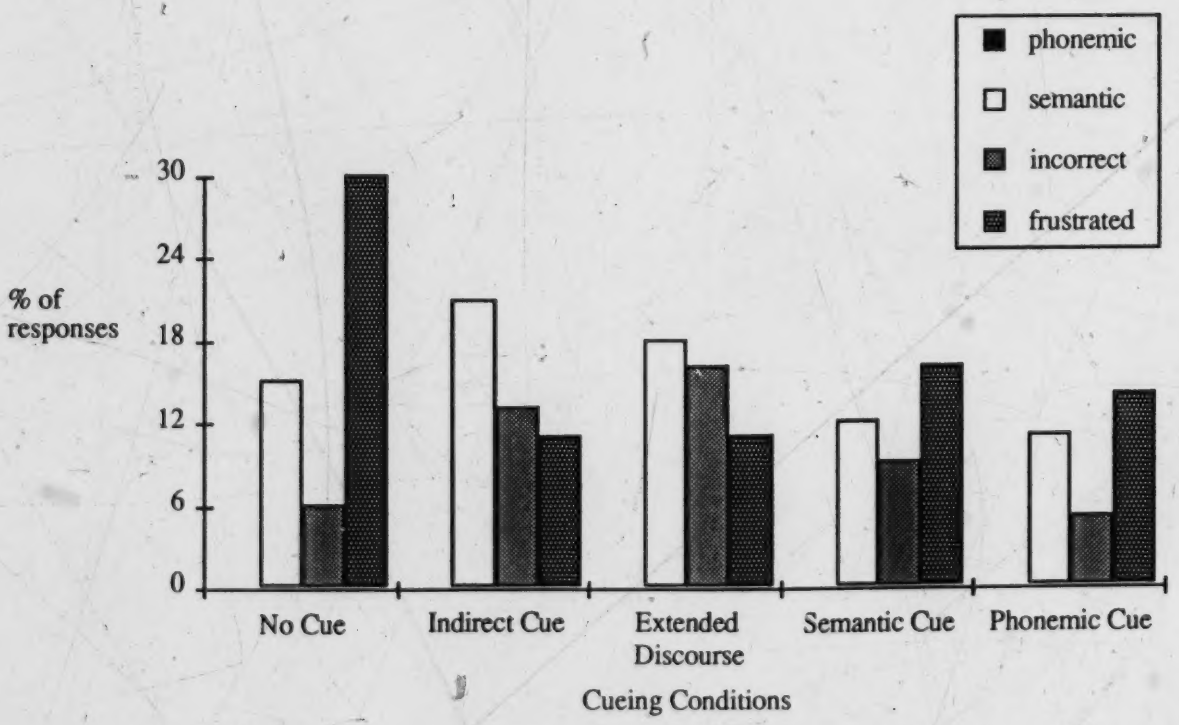


Figure 11 reveals that Subject #2 spent considerably more time retrieving target words during the "extended discourse" condition than in any of the other cueing conditions. Approximately 33 minutes was spent during the "extended discourse" conditions as compared to approximately 10 minutes for each of the other conditions, suggesting that either Subject #2 found contextual cues to be interference to retrieval, or contextual cues allowed greater analysis and linguistic reasoning to occur, thus consuming more time (Figure 11).

Consistent with the finding of increased retrieval time during "extended discourse" is the finding of increased mean retrieval times per item during the same condition. Figure 12 illustrates the increase of mean retrieval time regardless of linguistic class. In general, it is evident from Figure 12 that Subject #2 spent more time retrieval on each verb than either category or exemplar. Such was the case across cueing conditions, with the exception of "extended discourse."

Figure 13 illustrates the proportion of retrieval time devoted to each linguistic class. As the reader will recall, due to the fact that 50% of the stimuli used were verbs, 25% categories, and 25% exemplars, simple calculation leads to the prediction that 50% of retrieval time would be devoted to verbs, 25% to categories and 25% to exemplars. Subject #2 typically spent more than the predicted time in retrieval activities for verbs. Retrieval time for categories and exemplars was inconsistent across cueing conditions, but tended to hover close to the predicted level.

Subject #3

Subject #3 benefitted most from the "semantic cue" condition. "Phonemic cueing" was next most helpful followed by "indirect cue," "no cue" and "extended discourse." These findings are illustrated in Figure 14. Subject #3 produced correct responses to a level of 77% frequency during the "semantic cue" condition, suggesting that semantic strategies and storage are used by this Subject. The lowest level of correct responses was

FIGURE 10

Distribution of % Correct - Linguistic Class Across Cueing Conditions
Subject #2

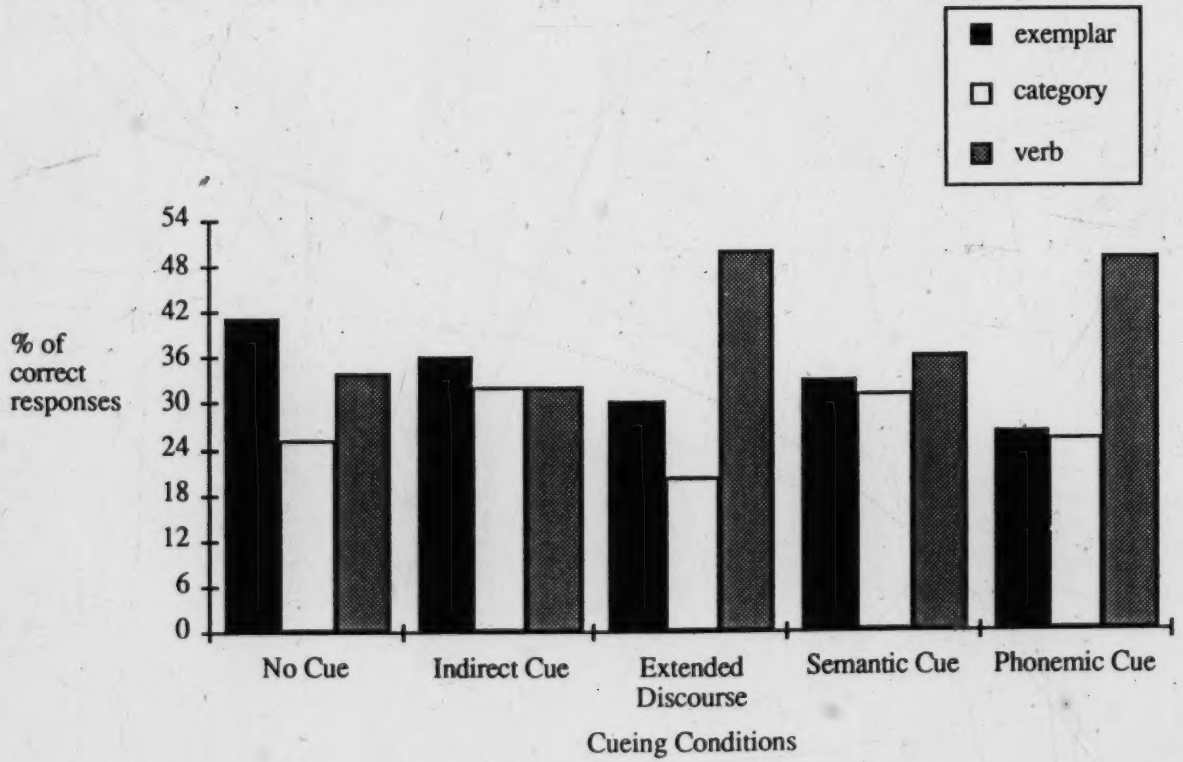


FIGURE 11

Total Retrieval Time x Cueing Conditions
Subject #2

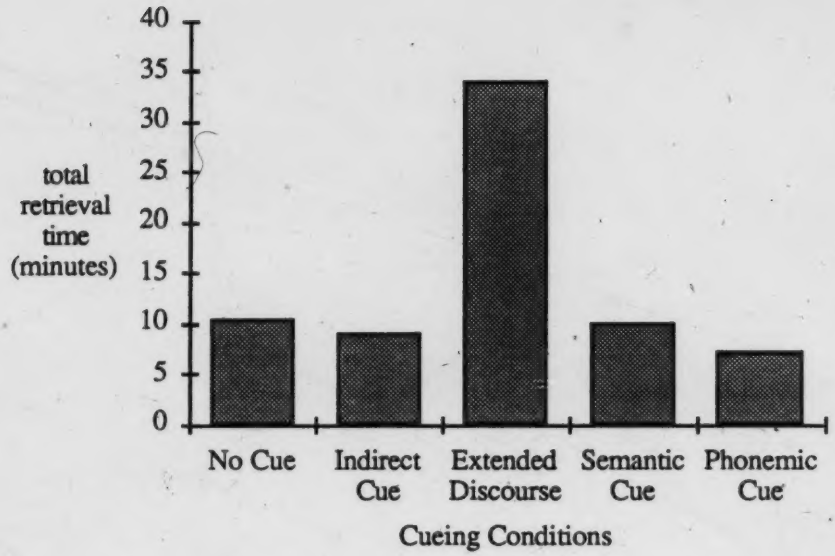


FIGURE 12

Mean Retrieval Time - Linguistic Class x Cueing Conditions
Subject #2

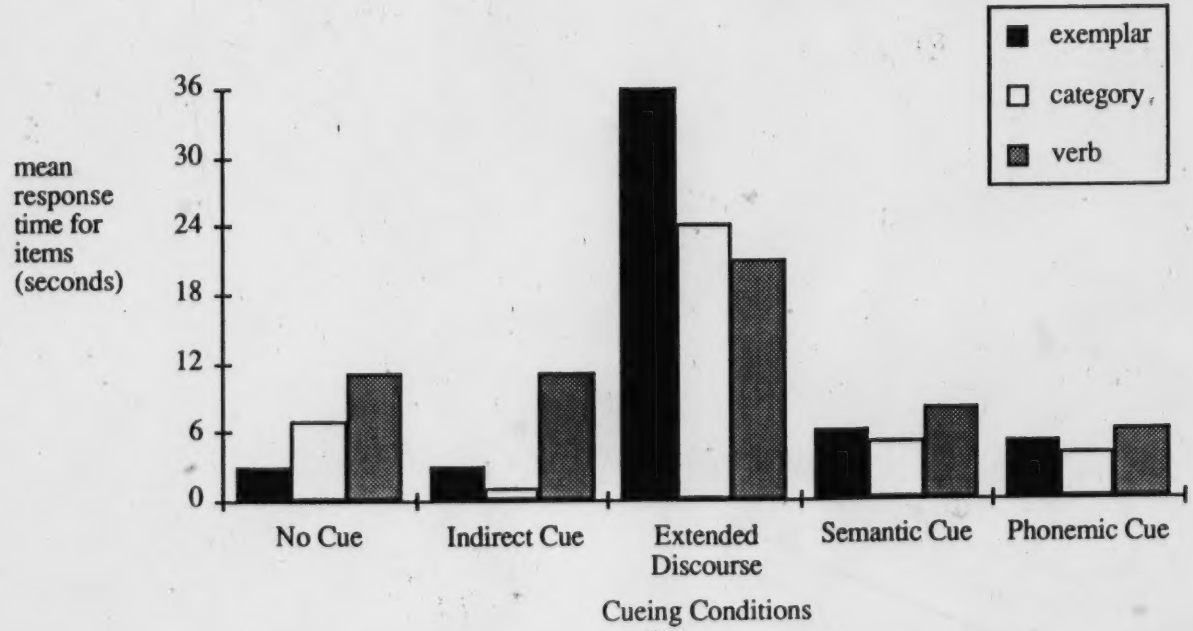


FIGURE 13

Proportion of Total Retrieval Time - Linguistic Class x Cueing Conditions
Subject #2

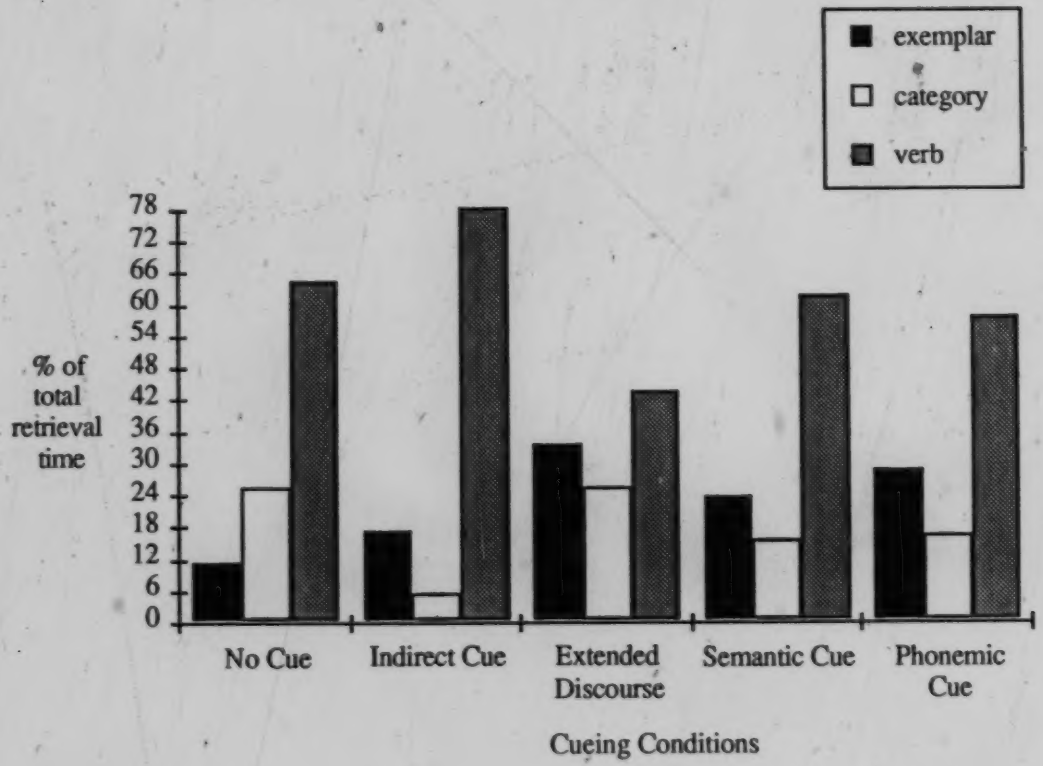
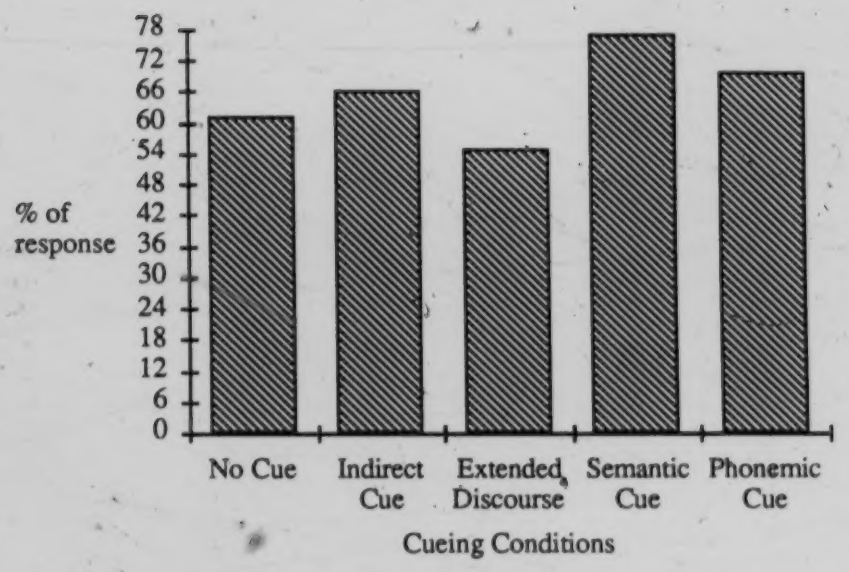


FIGURE 14

Correct Responses x Cueing Conditions
Subject #3



Examination of Figure 15 reveals that the majority of Subject #3's incorrect responses, were semantically related to the target word, again implicating the use of semantic storage. Very few of the subject's responses were phonemically related to the target word. Frustration levels remained relatively stable across cueing conditions with the exception of "extended discourse."

A closer examination of the nature of Subject #3's correct responses indicates that the subject found verbs to be more readily retrievable. The proportion of correct responses which were verbs far exceeded either category or exemplar proportions. Consistency across the conditions is clear (See Figure 16).

FIGURE 15

Phonemically Related, Semantically Related, Incorrect and Frustrated Responses Across Cueing Conditions
Subject #3

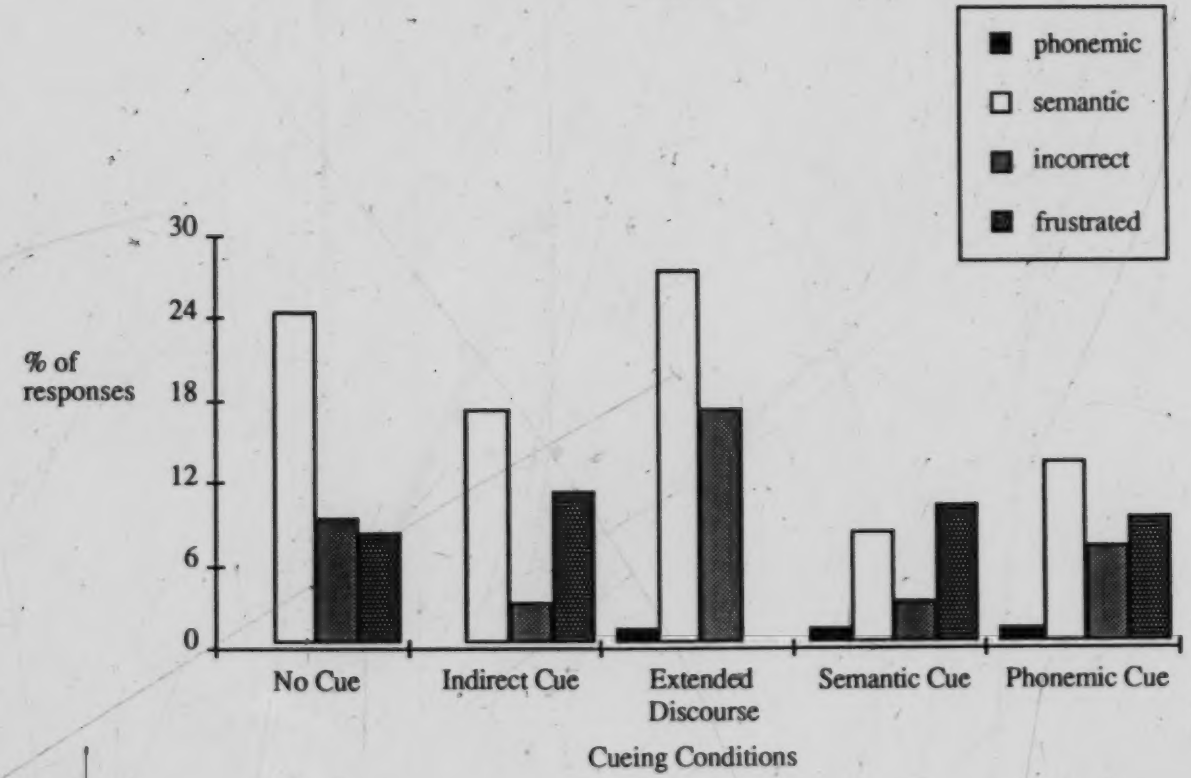
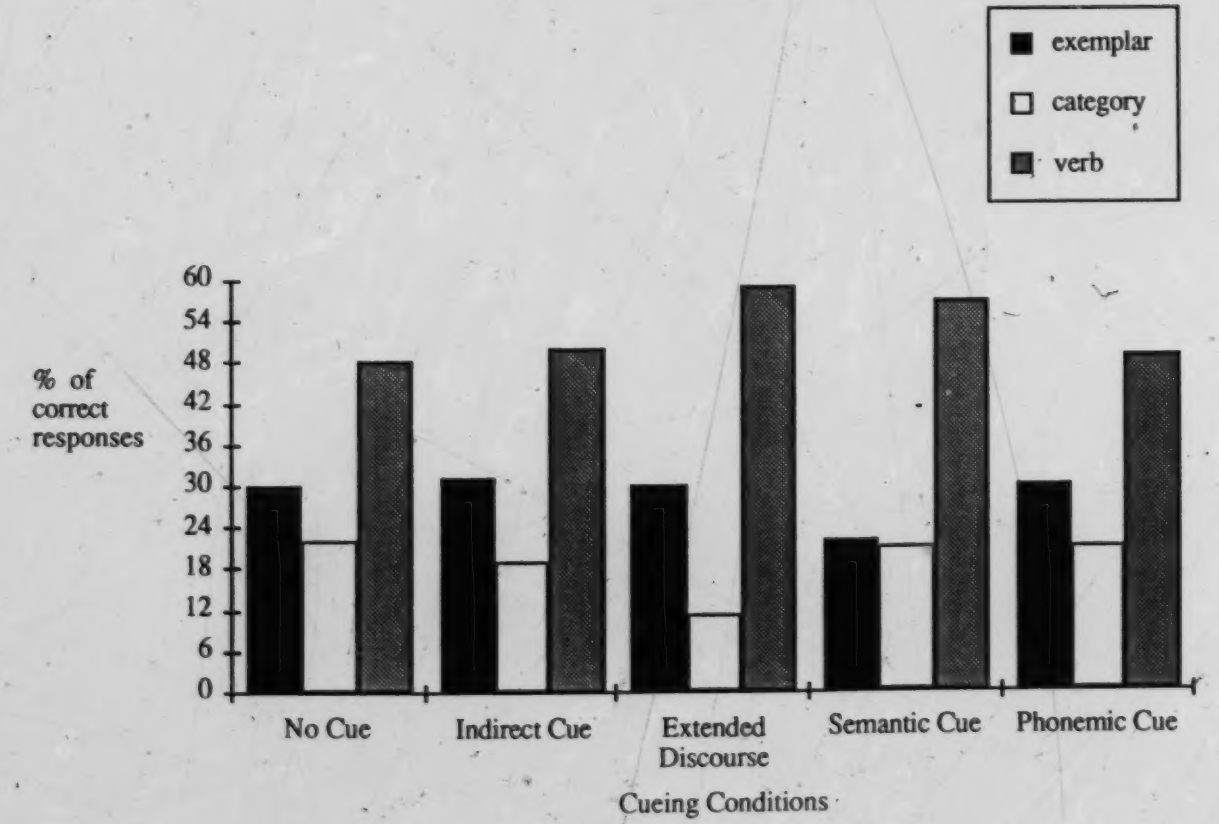


FIGURE 16

Distribution of % Correct - Linguistic Class x Cueing Conditions
Subject #3



evident during "extended discourse." Contextual information appeared not to be useful for Subject #3.

Generally, categories comprised the smallest proportion of correct responses across all conditions.

The "extended discourse" condition used up the largest amount of time involved in retrieval activities. Approximately 25 minutes was used to complete the "extended discourse" condition as compared to 6-10 minutes for the remaining cueing conditions. Figure 17 reveals that "phonemic cueing" required the least amount of time across conditions.

FIGURE 17

Total Retrieval Time x Cueing Conditions
Subject #3

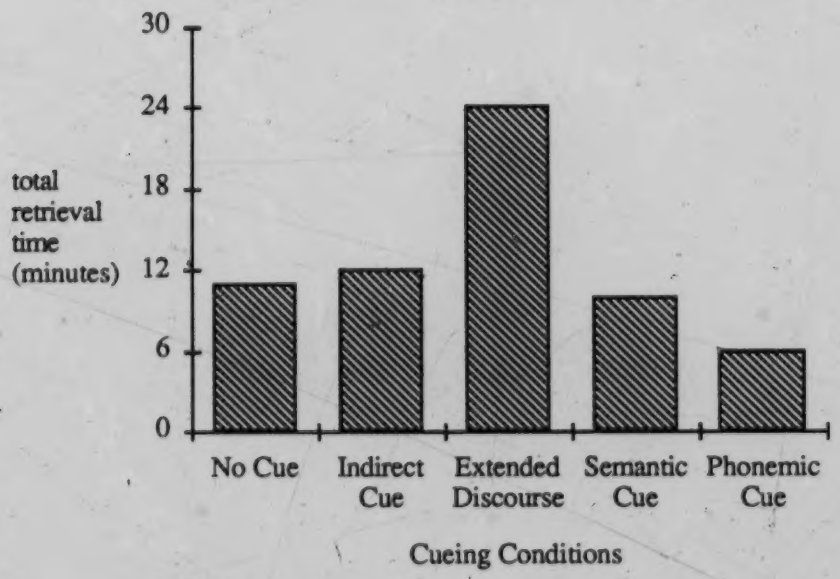
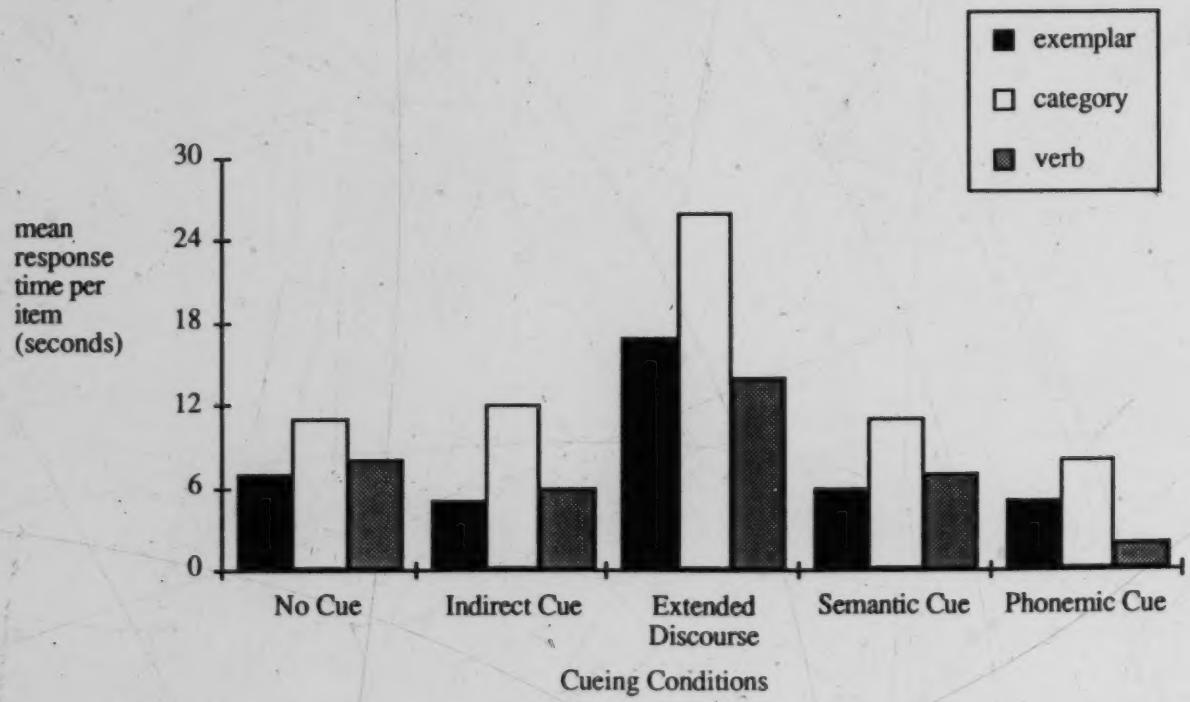


Figure 18 considers the mean retrieval time required per item across the three linguistic classes of verb, category and exemplar. It is evident from this figure that category retrieval required the greatest time per item, with the remaining two linguistic classes being similar. The class means were consistent across all conditions with the

FIGURE 18

Mean Retrieval Time - Linguistic class x Cueing Conditions
Subject #3



exception of "extended discourse." During "extended discourse," the mean retrieval times per item across linguistic classes were elevated.

In relation to the proportions of retrieval time devoted to linguistic classes, Subject #3 performed similarly to what would be predicted. The only variation from the predicted 50% for verbs, 25% for exemplars and 25% for categories had to do with the latter. Typically, across conditions, Subject #3 devoted more than the predicted 25% of total retrieval time to categories (see Figure 19). Perhaps, as previously considered with the other subjects, categorical analysis requires higher level semantic strategies. Such strategies would presumably require more time to execute than would simple labeling.

Subject #4

Figure 20 illustrates the proportion of correct responses produced during the various cueing conditions. From the illustration it can be seen that both "extended discourse" and "phonemic cueing" elicited the greatest proportion of correct responses. "Indirect cueing" produced the fewest correct responses suggesting that Subject #4 considered the indirect praise as an irritating factor, rather than one meant to encourage.

The remaining responses elicited by this cueing conditioned can be viewed on Figure 21. Subject #4 produced a relatively low proportion of incorrect but phonemically related responses, suggesting that phonemic storage is unlikely for this Subject. Semantically related responses were typically more frequent than any other incorrect responses. During the "no cue" and "indirect cue" conditions, semantically related responses were frequent. Perhaps when provided with little guidance, Subject #4 relies primarily on semantic strategies.

Figure 22 reveals several characteristics of Subject #4. Typically this Subject produced low proportions of correct categories. Across all conditions, the proportion of correct categories fell well below that of either correct exemplars or verbs. Typically, a greater number of correct verbs was produced across conditions than number of correct

FIGURE 19

Proportion of Total Retrieval Time - Linguistic Class x Cueing Conditions
Subject #3

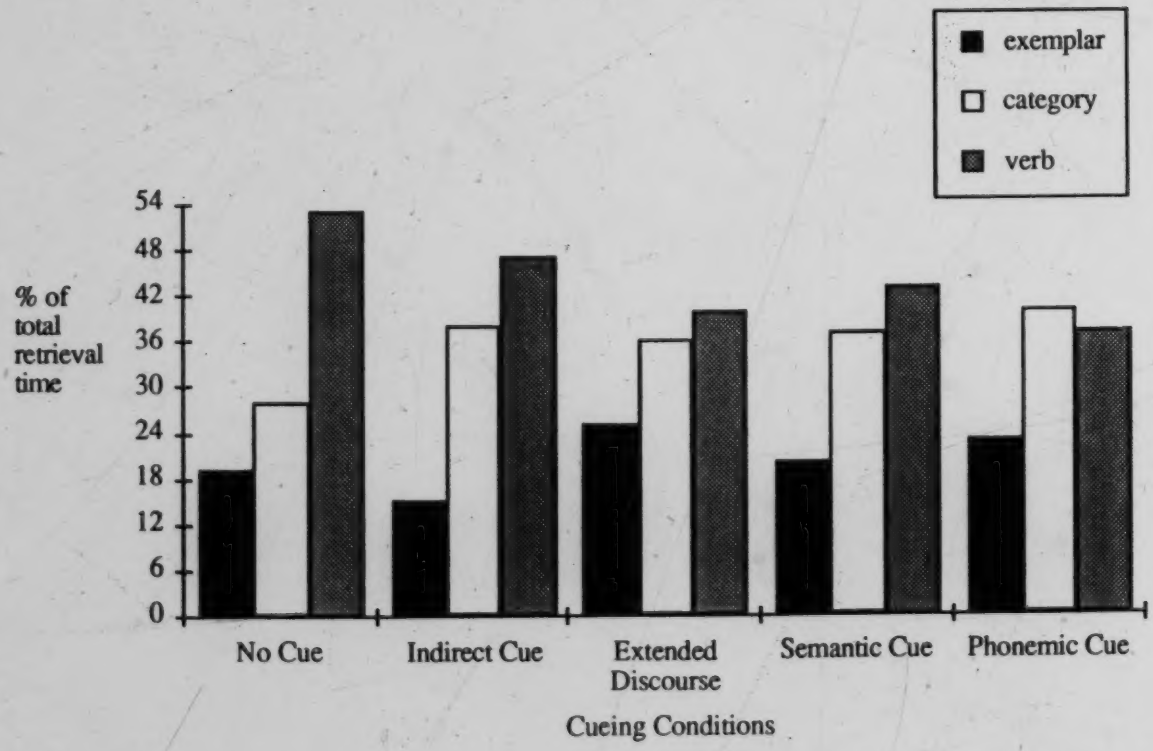
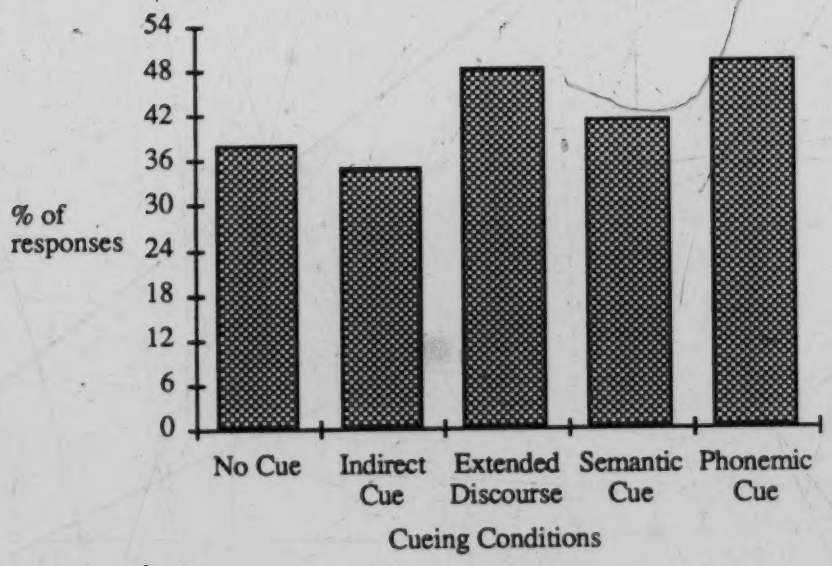


FIGURE 20

Correct Responses x Cueing Conditions
Subject #4



exemplars. The "no cue" and "phonemic cue" conditions produced the greatest number of correct verbs elicited.

In relation to the total time spent by Subject #4 in retrieval activities, the "phonemic cue" condition was the most economical condition. Thirteen minutes were required for the "phonemic cue" condition. Such a time was at least 6 minutes less than any of the remaining conditions. "Extended discourse" consumed the greatest amount of time, at 24 minutes. These results are displayed in Figure 23.

With few exceptions, the mean retrieval time per item for this Subject remained constant relative to linguistic class. Figure 23 reveals that in all but one instance, exemplar retrieval consumed the least time per item, followed by verbs and then categories. Such as the case across cueing conditions. The observation may reflect an disruption of higher level semantic strategies required for categorical analyses (See Figure 24).

FIGURE 21

Phonemically Related, Semantically Related, Incorrect and Frustrated Responses Across Cueing Conditions
Subject #4

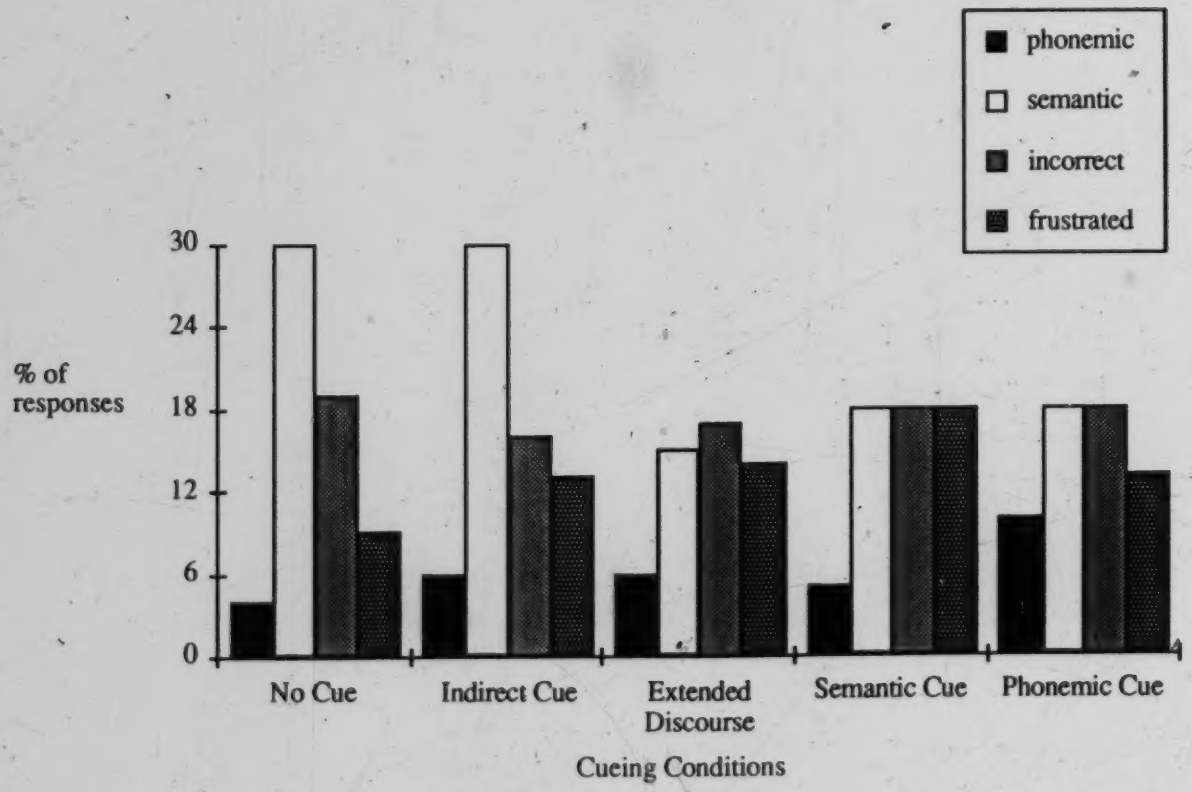


FIGURE 22

Distribution of % Correct - Linguistic Class x Cueing Conditions
Subject #4

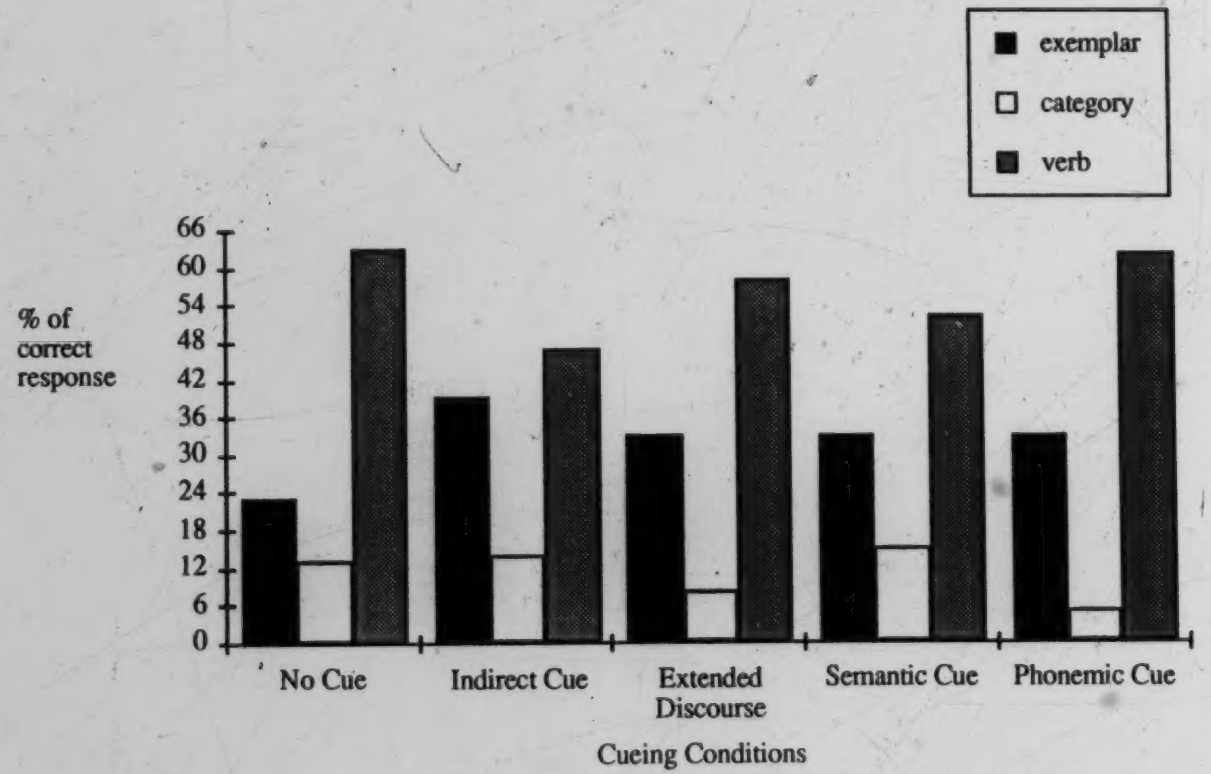


FIGURE 23

Total Retrieval Time x Cueing Conditions
Subject #4

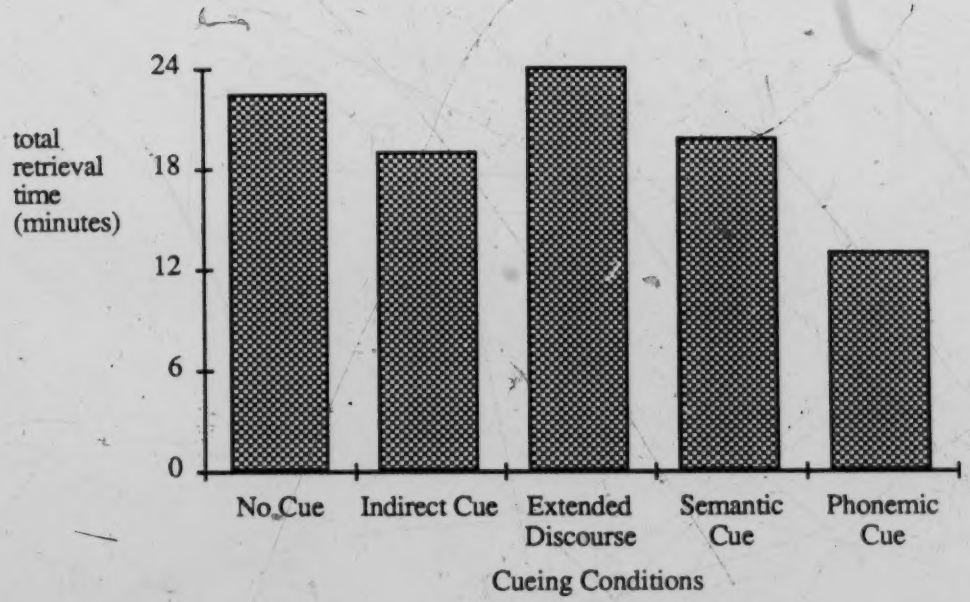


Figure 25 reveals that verb retrieval consumed the greatest proportion of retrieval time, followed by categories and then exemplars. Using simple mathematics, it would be predicted that 50% of the total retrieval time should be consumed by verb retrieval, as verbs constituted 50% of the stimuli. The remaining time would predictably be evenly distributed between time devoted to categories and exemplars. For Subject #4, the amount of total time spent on category retrieval was greater than what would have been expected, given the previous argument. Again, the higher level semantic skills required for categorical analysis may be implicated.

Subject #5

Subject #5 had the highest proportion of correct responses out of the five subjects. Ninety five percent of responses produced during "phonemic cueing" were correct. This was followed by "semantic cueing" at 79%, "no cue" at 71%, "extended discourse" at

FIGURE 24

Mean Retrieval Time - Linguistic Class x Cueing Conditions
Subject #4

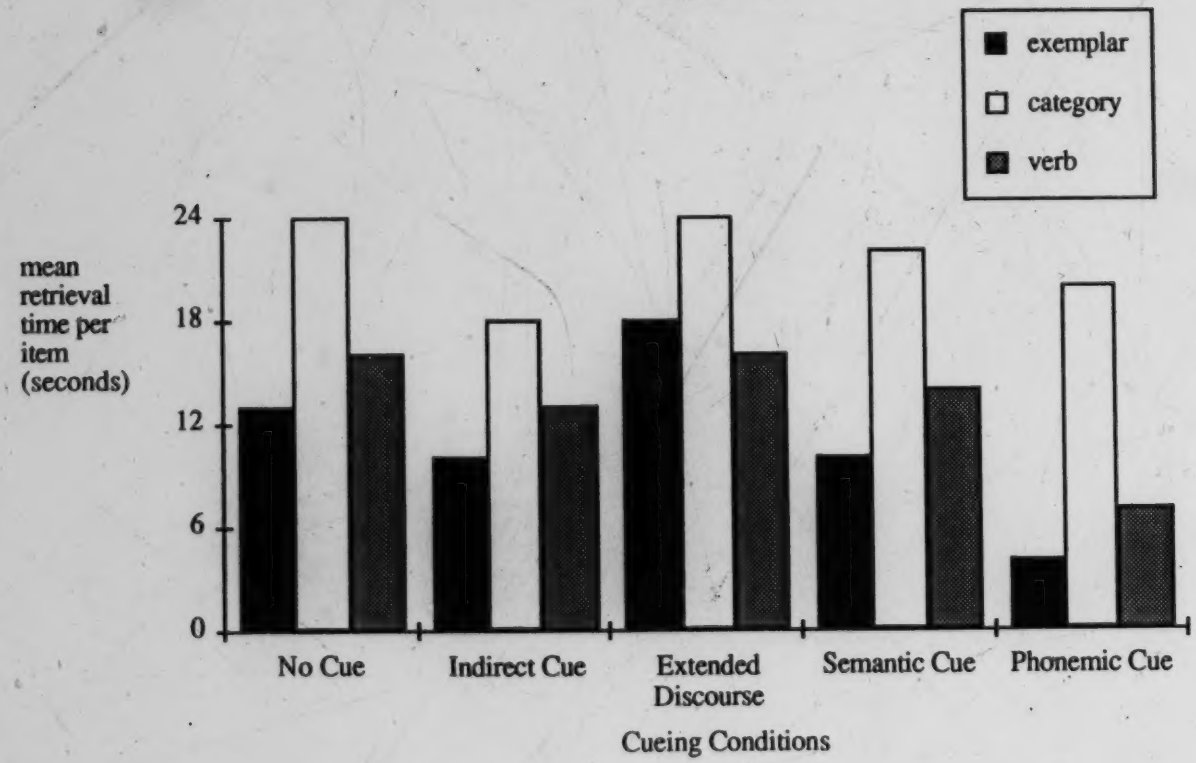


FIGURE 25

Proportion of Total Retrieval Time - Linguistic Class x Cueing Conditions
Subject #4

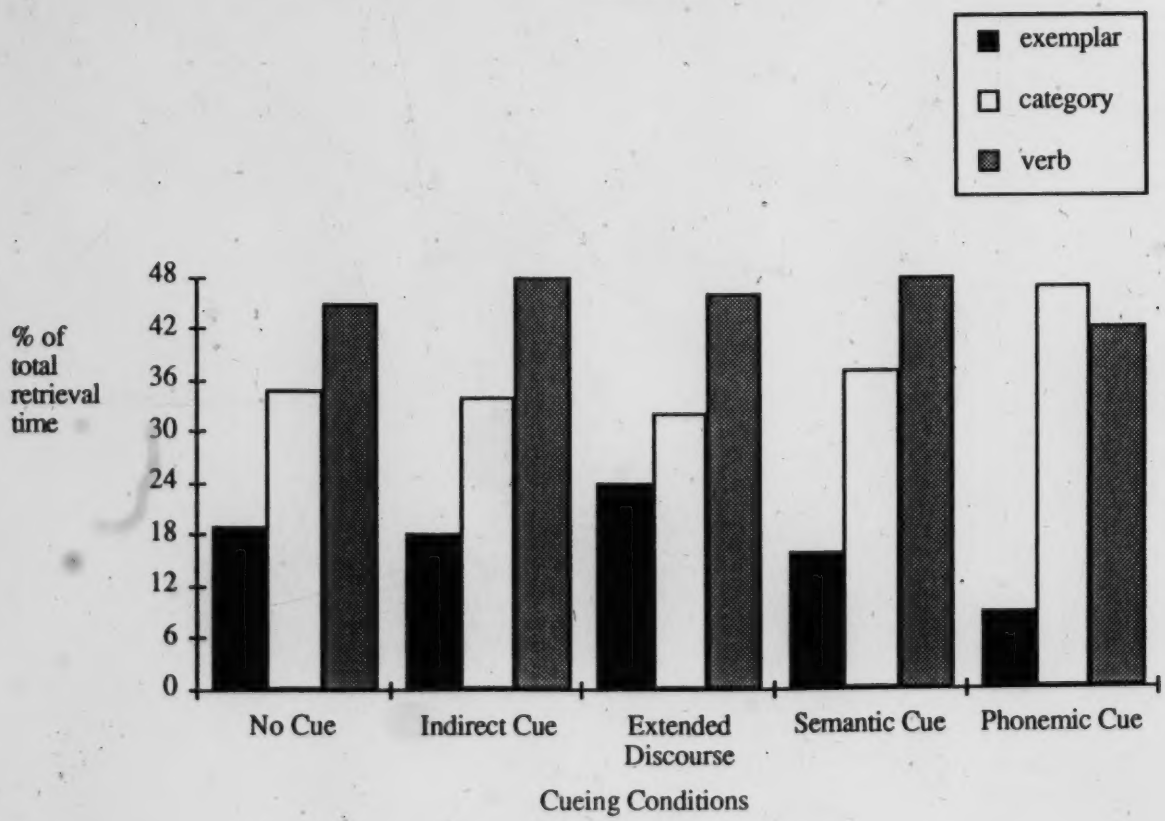


FIGURE 26

Correct Responses x Cueing Conditions
Subject #5

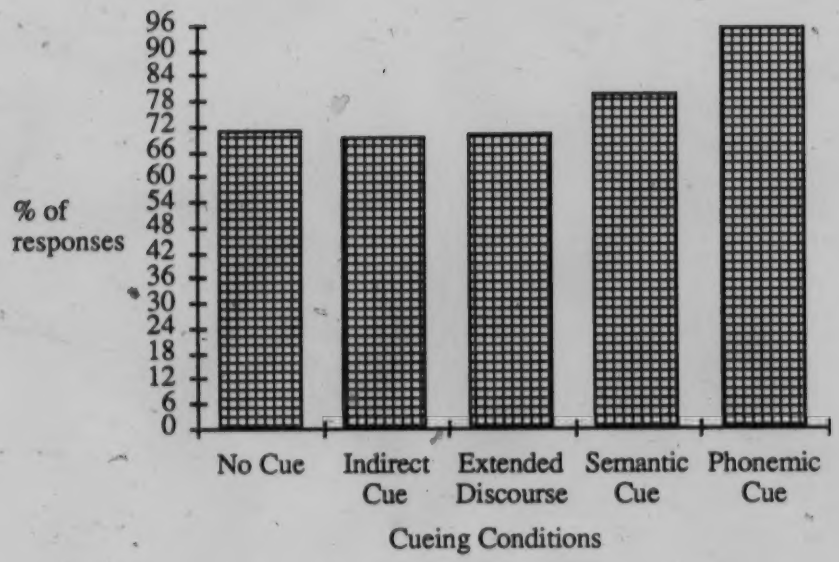
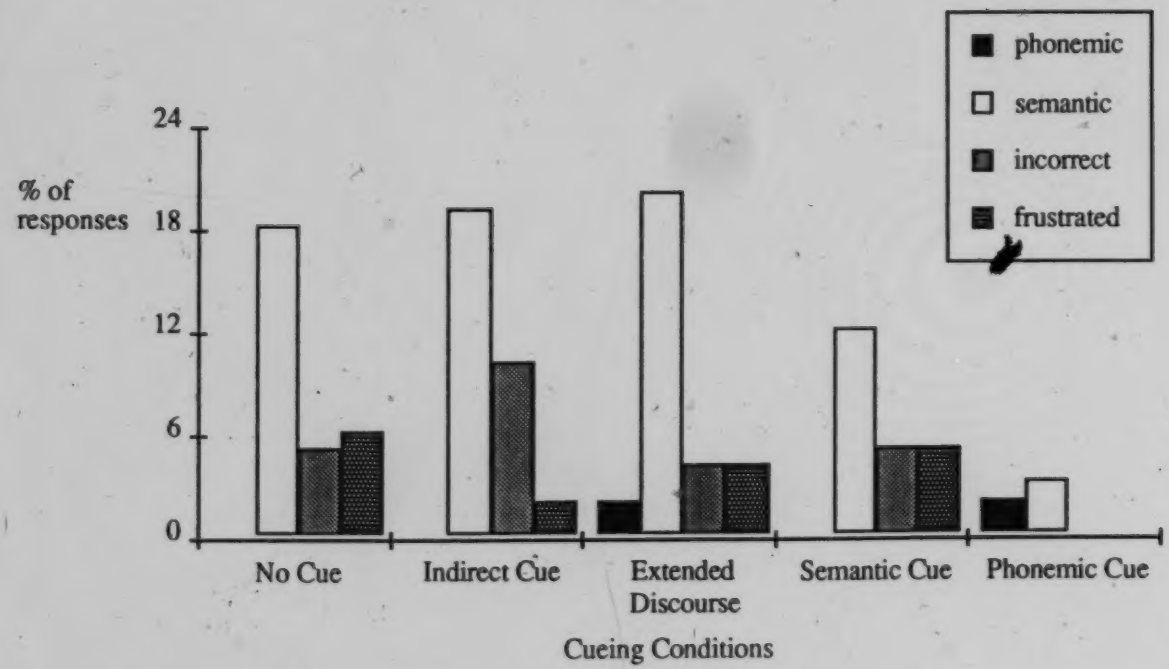


FIGURE 27

Phonemically Related, Semantically Related, Incorrect and Frustrated Responses Across Cueing Conditions
Subject #5



70%, and "indirect cue" at 69%. "Phonemic cueing" showed clear superiority in it's facilitation in correct retrieval for Subject #5 (See Figure 26).

Figure 27 reveals that Subject #5's remaining responses were most often semantically related to the target word. A minimal number of phonemically related responses were produced across conditions. Subject #5 experienced low levels of frustration across conditions.

Considering more closely the nature of Subject #5's correct responses, it is evident that he found verbs most readily retrievable. Consistently across cueing conditions, the proportion of correct verbs nearly doubled the proportions of correct exemplars and categories. There was little variation in relative proportions of correct responses either in relation to linguistic class or cueing condition (See Figure 28).

Figure 29 illustrates the increased time consumption during "extended discourse." The "extended discourse" condition consumed 24 1/2 minutes of overall retrieval time. The "no cue" condition consumed 19 1/2 minutes. Only 4 1/2 minutes was used by during the "phonemic cue" condition. As with previous subjects, Subject #5 may have been at a disadvantage when given contextual cues, thus increasing the time required to retrieve during "extended discourse." An alternative possibility relates to the usage of higher level semantic strategies being used in response to contextual information.

The increased time required for retrieval during the "extended discourse" condition is also evident when mean retrieval times per item are considered. Retrieval time means for "extended discourse" were consistently above those for the other cueing conditions. There appears to be little consistency in relation to mean retrieval time per item across linguistic class (Figure 30).

As noted in the previous four subjects, the proportion of overall time spent involved in retrieval activities, is directly related to the distribution of stimuli across the linguistic classes. Since 50% of stimuli was verb in nature, 25% category and 25% exemplar, 50% of the total retrieval time should be devoted to verb retrieval, 25% to categories and 25% to

FIGURE 28

Distribution of % Correct - Linguistic Class x Cueing Conditions
Subject #5

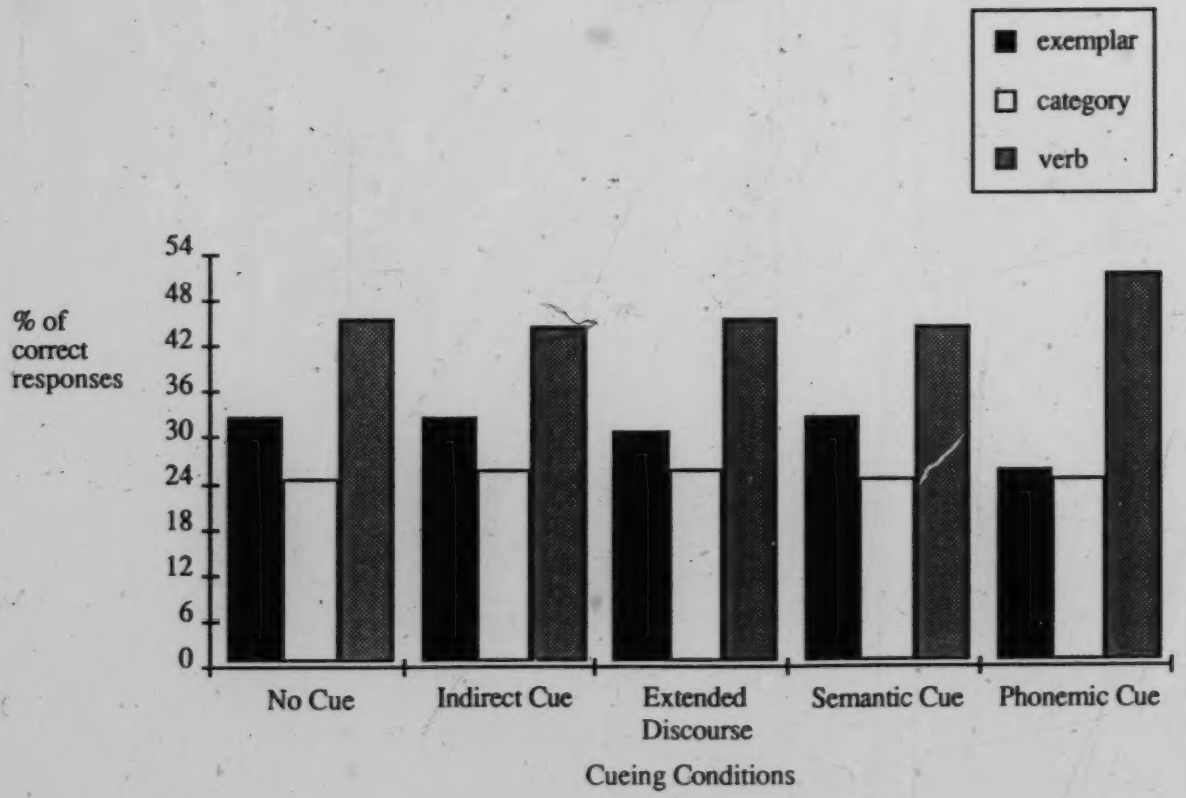


FIGURE 29

Total Retrieval Time x Cueing Conditions
Subject #5

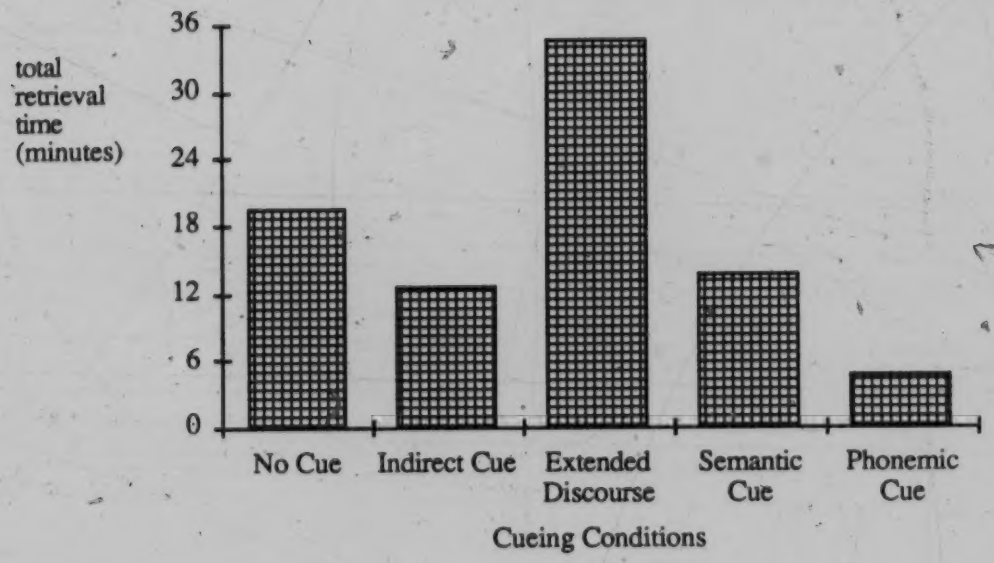


FIGURE 30

Mean Retrieval Time Per Item - Linguistic Class x Cueing Condition
Subject #5

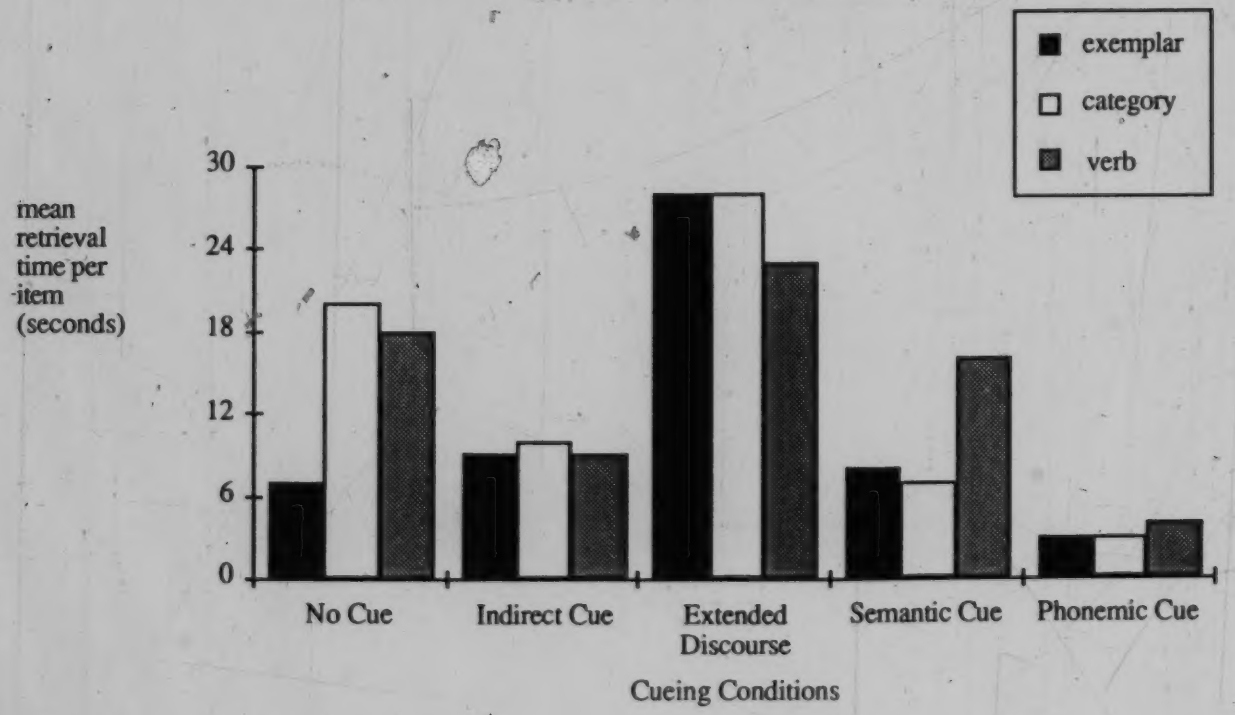
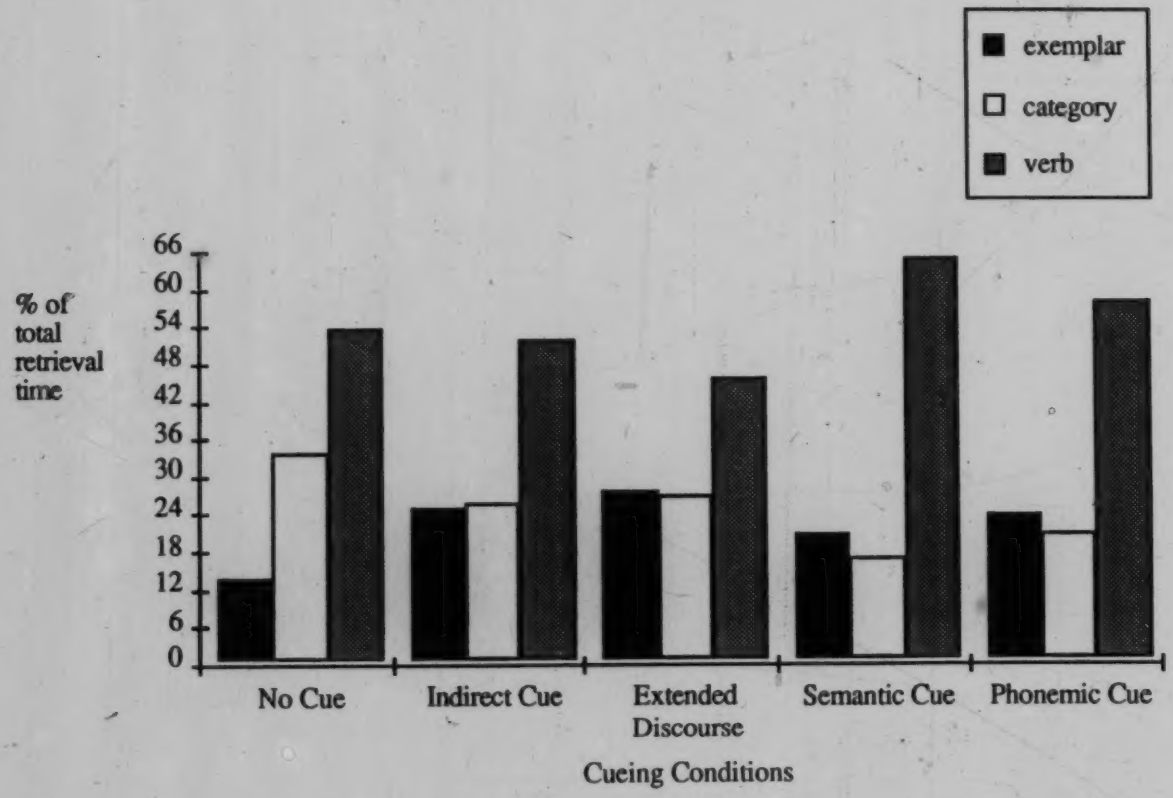


FIGURE 31

Proporation of Total Retrieval Time - Linguistic Class x Cueing Conditions
Subject #5



exemplar retrieval. These figures can be discerned through simple mathematic reasoning. Figure 31 shows that Subject #5 did not vary greatly from the expected values.

Up to this point, the results have been considered on a subject by subject basis. Now, the results will be considered as they relate to the group of all subjects. This between-subjects information provides an additional perspective of word retrieval deficits.

Between Subjects

The results of the five testing sessions, when considered across subjects, provide some generalized findings. In response to the first question posed in this study (see pg. 35), all five subjects responded favorably to "phonemic cueing," at least in terms of successful retrieval (see Figure 32). Approximately 72% of all responses given by the five subjects were correct when "phonemic cueing" was used. Secondly, all subjects benefited from semantic cueing, but not to the same degree as when a "phonemic cue" was provided. Thirdly, there appeared to be little difference between the three remaining conditions in terms of accuracy of retrieval.

It could also be stated that all five subjects benefited maximally by either a "phonemic" or a "semantic cue." In all cases the accuracy attained by these two conditions equalled or surpassed all other cueing conditions. Therefore, it might be hypothesized in answer to the third research question posed, that it is not the nature of the cue which is of the greatest importance, but rather it is the "directness" or degree to which it aids to focus the word search for an individual.

In relation to time invested in retrieval activities, "phonemic cueing" produced the lowest mean time. Approximately 10 minutes of retrieval time was spent per subject during the "phonemic cueing" condition. Slightly higher, at 14 minutes was "semantic cueing." The "indirect cue" performed third with a retrieval mean of 16 minutes. Finally, the "extended discourse" condition produced the greatest mean time, with 30 minutes being spent on retrieval efforts. This would suggest that "extended discourse" does in fact involve "other skills" than those required for simple confrontation naming as was

FIGURE 32

Mean Accuracy of All Subjects Across Conditions
as Compared to Individual Subject Accuracy

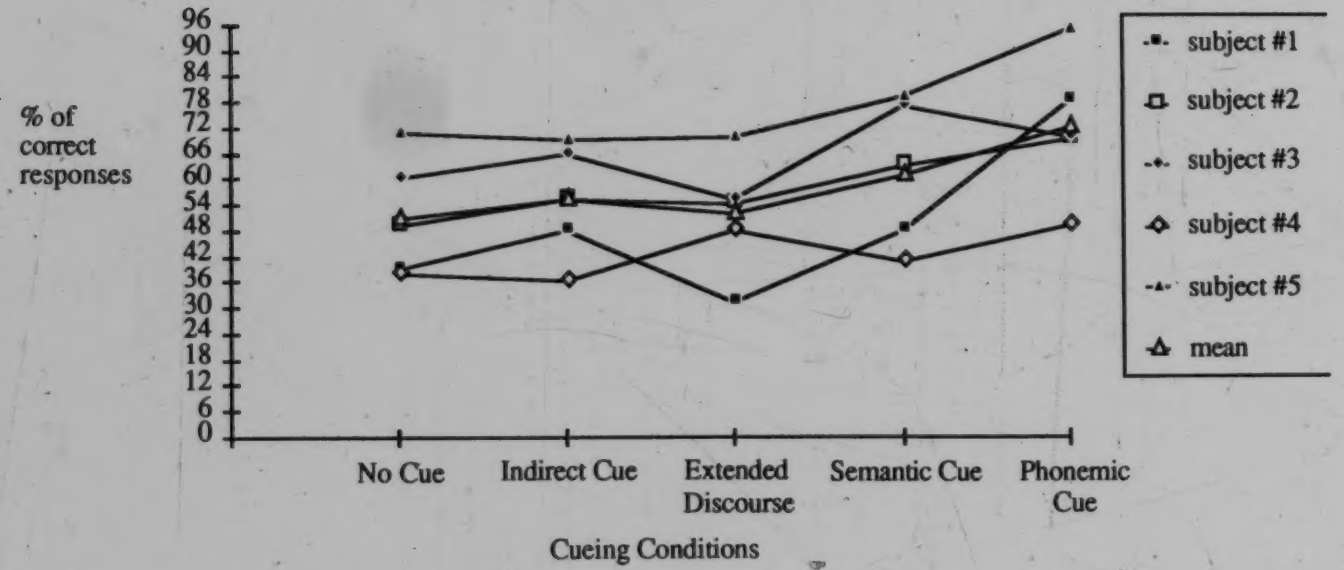
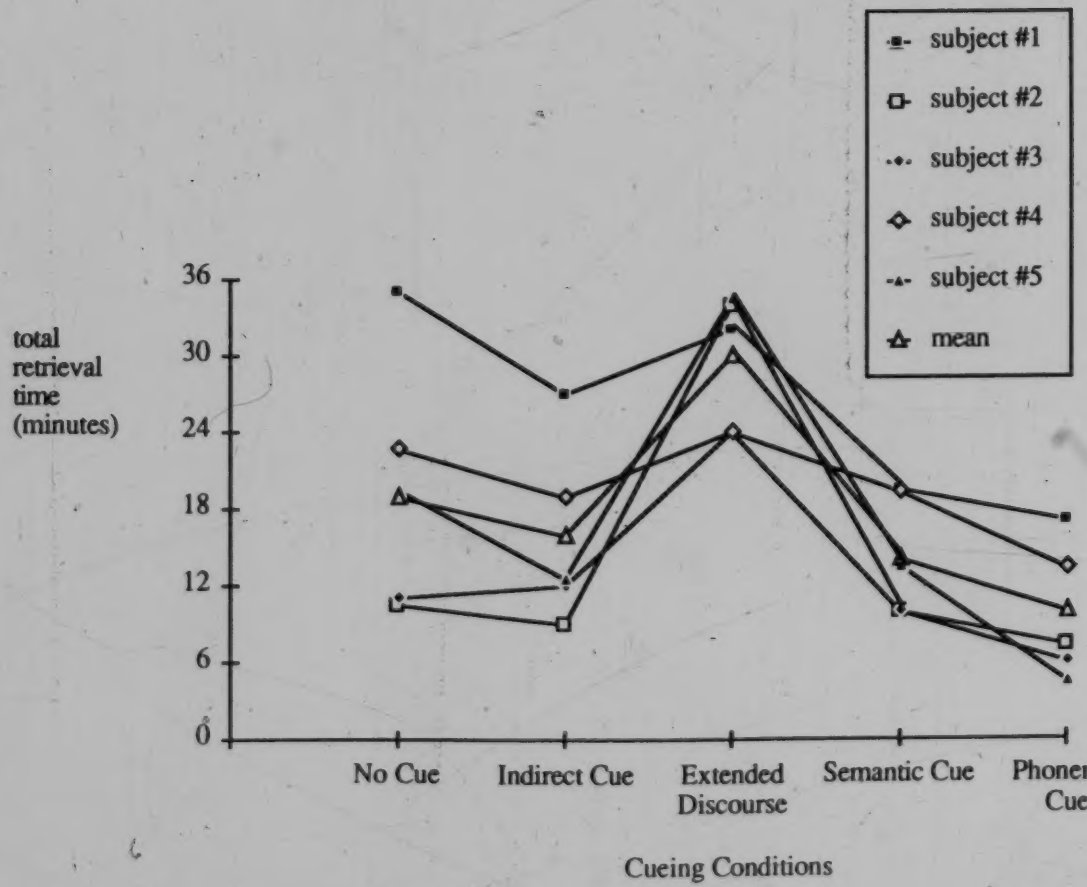


FIGURE 33

Total Mean Retrieval Time of All Subjects Across Conditions
Compared to Individual Subject Total Mean Retrieval Time



questioned in the questions posed on page 35. Given that the time required for retrieval during "extended discourse" exceeded that consumed when no cue was provided, this suggests that the added contextual information may cause some interference in the retrieval process (Figure 33) and that as research questions #5 and 6 refer to extended discourse and confrontation naming do appear to be different activities involving different skills.

In response to research question #2, it appears that category retrieval was most problematic for all subjects. Exemplar and verb retrieval were less difficult.

All subjects experienced the least degree of success in relation to the retrieval of superordinate categories. Verbs and exemplars, in general, were more receptive to cues than were the category labels. This finding suggests that a higher level cognitive/perceptual skill is involved in the categorization process which is not readily aided by sound or meaning based cues.

Frustration

For the purposes of this study, frustration was defined as any verbal declaration of irritation, or of the subject expressing his lack of knowledge of the answer, or the subject's wish to abort an item.

From the data obtained, no pattern relating to frustration emerged either on a within-subject or between-subject basis. This would suggest that the occurrence of frustration is as idiosyncratic as are the patterns of successful retrieval. For example, Subjects #2 and #4 generally have higher levels of frustration than do the remaining three subjects. Each subject must be considered individually when drawing hypotheses which attempt to interpret his/her unique pattern of frustration. Subject #1, in particular, appeared to become frustrated when a cue which was "typically" successful failed to be effective. When the cue failed to live up to the expectation, Subject #1 became frustrated.

Subject #2 built frustration in a manner which could be predicted. This means that frustration was most observed when the amount of information provided by the examiner was minimal. Thus, the "no cue" condition resulted in the highest level of frustration.

Subject #3 experienced the highest proportion of frustration during "indirect cueing." This individual, who was very aware of his condition, may have been irritated by someone encouraging what he considered to be a poor performance.

Subject #4 experienced the most frustration responding to the "semantic cue" condition. Earlier it was suggested that this subject, when provided with a cue which was usually assistive, would search for the word. If the word did not become immediately accessible, frustration resulted, leading to simple guessing.

Finally, Subject #5 expressed negligible levels of frustration for most of the conditions. The "no cue" condition produced a 6% level of frustration, or the highest across conditions. It might be suggested, therefore, that this subject experienced greater irritance when no information was provided for focusing "the search."

Clearly each pattern is very different for the five subjects of this study. It would be reasonable to say that any factor which fails to assist, or directly interferes with the retrieval performance would generate higher levels of frustration. There appears, however, to be little consistency across conditions or subjects. It is most interesting to note in all cases except one that the condition in which the subject experienced the greatest frustration was not the condition generating the poorest retrieval performance. In fact, in one case, the reverse was true. Thus, four of the five subjects did not respond as one might have predicted, that is, their increased frustration did not generally lower performance. In only one instance was this the case.

CHAPTER 5
DISCUSSION

Within Subject

The vast majority of hypotheses which can be addressed from this study pertain to within subject or individual analysis rather than consideration of the group.

Subject #1

In relation to the first research question posed in this study (see pg. 35), Subject #1 received the most benefit from "phonemic cueing" meaning that the greatest proportion of correct responses was generated using phonemic cues within the least amount of retrieval time. Moreover, "phonemic cueing" elicited the fewest incorrect but semantically related responses. This suggests that Subject #1 stores information phonemically, not semantically. "Semantic cueing" may do no more than focus the attention of this subject. If that is the case, it would help to explain the similar levels of effectiveness between "semantic" and "indirect" cueing in eliciting correct target responses.

Kany and Ellis (1987) suggested that if impairment is at the semantic level, then the subject should respond better to phonemic cueing. Since this seems to be the case with Subject #1, it is presumed that Subject #1 has "learned" to utilize the phonemic system rather than semantic, but whether this was the system preferred prior to the cerebral insult is unknown. It is also unknown whether the premorbid preference had any influence on the subject's current method of functioning. What this means, in effect, is that even if Subject #1 was not a phonemic storer of linguistic information, perhaps the impairment of his semantic channel had forced a switch.

The "no cue" condition produced poor time and accuracy scores, as did "extended discourse." Neither of these conditions helped to focus this subject's attention, whereas "indirect," "semantic" and "phonemic" cue conditions did. It would seem that the contextual cues provided by "extended discourse" could not be utilized by this subject

because the information provided by these cues is typically semantic in nature. Williams and Canter (1987) also found that contextual information did not foster word retrieval.

The second research question to be considered deals with the effect of part of speech in relation to word retrieval. Categories, according to the literature, utilize higher level semantic organization. As Subject #1 displayed markedly poorer retrieval of categorical nouns, higher level semantic organization may no longer be functional for Subject #1. Two possible explanations exist for Subject #1's difficulty. Either he may not benefit greatly from semantic cues due to a reliance on phonemic storage and phonemic strategies or, alternatively, he may suffer from what Collins and Loftus (1975) referred to as an inability to make the conscious meta-linguistic judgements necessary to assess the semantic properties of the lexicon. Caramazza, Berndt and Brownell (1982) also referred to this meta-linguistic process.

When considering the poorer retrieval of superordinate categories, one must also consider the possibility that it merely reflects the inability to retrieve due to the lack of contextual information, as Williams and Canter (1987) suggested. This would seem unlikely to be the case in this situation, as even when contextual cues were provided, the retrieval of category names was relatively low.

The retrieval of verbs appears to have been most greatly enhanced by cueing. Related to research question #5, this could suggest that the use of cueing can affect "word finding" more than "anomia." Because anomia involves noun retrieval, and more generalized word finding includes verbs, it is suggested that the latter was most affected. Nicholas, Obler, Albert and Goodglass (1985) concluded that the built-in contextual cues provided in an active phrase (verbs) would foster retrieval. Such retrieval requires less higher level semantic comparisons as well as less perceptual efficiency.

Frustration was highest for semantic cueing, followed by phonemic cueing. If Subject #1 stores material phonemically, providing semantic cues would presumably be ineffective and lead to a higher level of frustration. Likewise, when a typically useful cue

is provided (phonemic) and does not result in retrieval, frustration is generated. Each of these hypotheses would explain, to some degree, Subject #1's pattern of frustration, it is impossible to unequivocally know the reason or factor(s) behind the observed pattern of frustration.

In summary, Subject #1 responded with increased accuracy to "phonemic cueing," and did so in the least amount at retrieval time. It is suggested that semantic channel of this subject has been disturbed, causing the subject to rely upon phonemic information. Semantic information appeared to create irritation and frustration, as evidenced by his performance during "extended discourse."

Subject #2

In consideration of the first three research questions posed in this study, Subject #2's retrieval accuracy was higher for more structured sessions and lower for less structured sessions. For example, Suggest #2 did better when it appeared that the examiner was "trying to help," even when it was merely encouragement. This continued for both "semantic" and "phonemic" cueing conditions. The accuracy dropped when no encouragement/interest was expressed. This would lend support to Collins and Loftus's (1975) hypothesis related to the lack of meta-linguistic judgements. If, for example, Subject #2 was provided with no interaction from the researcher, uncertainty remained and the search for the word would continue. This is evident in the performance during "extended discourse" in which the uncertainty of the stimulus, and lack of "direction" from the researcher may have had a significant effect.

Though "phonemic cueing" produced marginally better results, both it and "semantic cueing" appeared to enhance correct retrieval and reduce retrieval time. This was true of verbs and categories in relation to correct retrieval, however exemplar retrieval was hindered in general. This is in keeping with the hypothesis of Nicholas, Obler, Albert and Goodglass (1975) that "anomia" (which is primarily exemplar retrieval) is less influenced by cueing.

In relation to question #2 specifically, this individual was more successful in exemplar/noun retrieval when no cue was given than when a cue was provided, suggesting that the cue served to hinder retrieval. This was particularly evident when the cue was contextual in nature. Williams and Canter (1987) found similar behaviors, with contextual information failing to enhance word finding.

It is unclear how Subject #2 stores linguistic information. She produced no phonemically related responses, though "phonemic cueing" had marginal superiority over "semantic cueing." On the other hand, "semantic cueing" appeared to interfere with exemplar retrieval. It is hypothesized that Subject #2 does use semantic storage techniques, but that higher level semantic strategies/storage are primarily being used. This explains the improvement of any cue type which focuses attention of the target on category and verb retrieval only. Exemplar naming which is strictly a paired response (S-R) requires lower level strategies, which are confounded by additional information. If this is indeed the case, then any type of cueing would only be somewhat effective, rather than being a global enhancer. While cueing would improve "word finding," it would do little for "anomia." This hypothesis follows the theory of Williams and Canter (1987) and their perception of word finding and anomia. The reader will recall that "word finding" can involve all parts of speech, while "anomia" refers to labels of objects and people. It would be these labels which would be confounded by the additional information provided by a cue.

Subject #3

The exceedingly high proportion of correct responses to the "semantic cue" condition suggests that Subject #3 utilizes semantic storage strategies for linguistic information. This would suggest that the disruption is located within the phonemic system. Support for this hypothesis is found in the observation that Subject #3 tended to fall back on semantic strategies even when the cues provided were phonemic. A relatively higher proportion of "semantically related" responses produced during "phonemic cueing" would tend to support this hypothesis.

Though "phonemic cueing" was beneficial for this subject, it was not markedly more beneficial than "indirect cueing." This suggests that the mere "focusing" or directing of the search is more critical than the nature of the cue itself. This relates to what Caramazza, Berndt and Brownell (1982) referred to as having lost the ability to pick out salient features of the target in order to begin the lexical search and refers to the first three research questions posed in this study.

"Extended discourse" and the lack of information regarding the specific target word appeared to cause Subject #3 to rely heavily on semantic strategies and, more specifically, associational strategies. This is indicated by the elevated proportion of "semantically related" responses produced during the "extended discourse" condition. The negative effect this has on retrieval is in keeping with what Williams (1983) terms stimulus uncertainty. It also suggests that Subject #3 was unable to choose selectively from the contextual information provided. Pierce and DeStefano (1987) refer to this type of behavior as the inability to "block out" context.

The role of stimulus uncertainty becomes more salient when Subject #3's level of frustration is considered. The less information Subject #3 had available regarding the specific target, the less frustration occurred. Presumably this subject had no idea as to the accuracy of his responses, so that he did not subsequently feel the failure associated with knowing what is requested.

In relation to the linguistic classes, and research question #2, categories proved the most problematic for Subject #3. This may suggest that the higher level semantic skills of comparison, contrast, class inclusion and exclusion are impaired, but that the lower level processes associated with word or exemplar relationships are less so. Warrington (1975) and Martin and Fedio (1983) found that access to information about attributes of an object, like what is required in comparison and contrast, is impaired in the dementias, even though knowledge of the category still exists. This is similar to what Subject #3 demonstrated. Bowles and Poon's (1985) hypothesis regarding the role of perception in this analysis of

attributes comes to the fore. But whether Subject #3's perceptual skills are impaired or not is unknown, so that the influence of the perceptual factor on performance in this study cannot be ascertained.

Subject #4

Subject #4, like the previous subject, seems to rely upon semantic storage strategies. Even in the "no cue" condition a high level of semantically related responses were produced. A reasonably high proportion of correct responses to "extended discourse" was also observed. This would suggest that any impairment which exists lies within the phonemic system as outlined by Kany and Ellis (1987). Again, the difficulty in making such an assessment is that the subject's premorbid preference for strategies and storage is unknown.

Subject #4 appeared to be in need of relatively immediate gratification in terms of retrieval. If a semantic cue did not quickly conjure up the desired word, this subject seemed to abandon the retrieval strategy and resort to one less efficient, or she simply guessed. This all-or-none phenomenon, in which the strategy of choice is quickly abandoned if not immediately fruitful, possibly reflects a pre-morbid reliance on phonemic strategies. The rapid abandonment of semantic strategies appeared to represent the transition to phonemic strategies.

As referred to in the first research question, while Subject #4 appears to encode information semantically, the "phonemic cue" was still effective in eliciting the target word. This too may point to a restructuring of this subject's storage techniques, and would be consistent with the higher level of frustration experienced during the "semantic cue" condition. There is little in the literature which addresses a possible "transition" or "restructuring" of retrieval strategies.

If the previous hypothesis is correct, and Subject #4 does store material semantically, the relative success of "phonemic cueing" in retrieval would suggest that the two systems, phonemic and semantic, are interrelated; in this case Bowles and Poon's

(1985)hypothesis of interrelationship is supported. Some form of transition or restructuring of function may also be represented.

In relation to the second research question, Subject #4 had considerable difficulty with category retrieval and less difficulty with exemplar retrieval. It is possible that lower level strategies for exemplar analysis utilize both semantic and phonemic information and storage. Higher level strategies associated with categorical retrieval are possibly semantic in nature, thus explaining why phonemic cues are less successful. It must also be considered, however, that this finding is explainable in terms strictly of linguistic class. Flicker, Ferris, Crook and Bartus (1987); Nicholas, Obler, Albert and Goodglass (1985); Williams and Canter (1987) all discuss the difficulty of category retrieval due to disruption of higher level semantic skills and the inability to carry out complex meta-linguistic judgements.

Subject #5

The high level of correct response to "phonemic cueing" and the non-existence of frustration during this condition support the notion that Subject #5 stores information phonemically, as does the fact that this subject's premorbid occupation relied heavily upon auditory skills. Also, the retrieval time for "phonemic cueing" was by far the most economical. Both findings shed light on the first research question of this study.

According to the Kany and Ellis (1987) notion, this evidence should suggest that the subject's semantic system has been disrupted. It is hypothesized that Subject #5 was premorbidly a "phonemic encoder", and remains so despite a semantic impairment. Though obvious difficulties in functioning exist, this subject's superior performance over all the other subjects suggests that he was least affected linguistically by his brain insult.

It appears that Subject #5 makes use of some semantic information which does not increase the accuracy markedly, but does reduce the required retrieval time, especially of categories. Thus, this subject may be able to at least partially make the meta-linguistic

judgements required for categorization. Nicholas, Obler, Albert and Goodglass (1985) state the need for such skills for retrieval of superordinate categories.

Though his accuracy did not decrease for "extended discourse," Subject #5 appeared sufficiently distracted by the contextual cues that his retrieval time was increased. This is consistent with the findings of Williams and Canter (1987) as well as Pierce and DeStefano (1987) who found either no benefit or actual interference of context upon retrieval. This finding relates directly to the third research question posed on page 35.

Considering the second research question of this study, Subject #5 showed little difference in performance in relation to linguistic class and conditions. The very fact that categories were as easily retrieved as exemplars and verbs supports the hypothesis that at least some of the higher level semantic skills survived the cerebral insult relatively unscathed.

In general, the more direct the cue provided, the greater the benefit. Subject #5 received in relation to retrieval success and time efficiency. This subject appeared to need limited cueing to "direct" the lexical search for the target word.

When one is considering treatment and intervention programs, it would be a mistake to consider the results of this study on a group basis. Because each subject showed his or her pattern of response, significant errors in treatment choice would result were the results interpreted on a group basis. Nevertheless, an across subject analysis of the results of this study is offered. Few general trends across the five subjects can be identified and interpreted with any degree of confidence in their validity and pragmatic relevance. Given this caution, the general trends evident in the group data are considered below.

Discussion

Between Subjects

Addressing the last research question posed in this study, Figure 32 shows that each of the five individuals responded most favorably to the "phonemic cueing" condition,

at least in terms of successful retrieval. Next to it, "semantic cueing" was most successful. Considerably less successful than the "phonemic" and "semantic" conditions were the "no cue," "indirect cue" and "extended discourse" conditions. These all generated a similar level of accuracy. The danger of interpreting the data in terms of this "grouped" result is apparent. If a clinician were to assume that the most successful cueing strategy was "phonemic," two of the five subjects in this project would experience considerable difficulty. Both Subjects #3 and #4 would be at a distinct disadvantage by such an assumption, as neither of those individuals demonstrated clear benefit when "phonemic cueing" was used. What this example serves to emphasize is the need for individual analysis of word retrieval deficits. Not only do individual differences exist, but these differences are easily masked by grouped results. For example, the Kany and Ellis' (1987) paradigm, which suggests that two of the subjects suffer from a semantic disruption and the remaining three from phonological disruption, would not be observable in the analysis of group data.

If Kany and Ellis are correct, a troublesome question remains: why was the retrieval time of all subjects reduced for the "phonemic cue" condition? If in fact, a phonological disruption exists why was the time advantage still present even when phonological cues were utilized. This finding is contrary to what Kany and Ellis (1987) indicated should occur.

The fact that some of the subjects did do markedly better in terms of retrieval when provided with a phonemic cue could be explained in two ways. Premorbidly, an individual might tend to be a phonemic encoder of linguistic information. For example, Subject #5, who was a concert pianist before his brain insult, most probably relied on "sounds" and other "auditory" information when encoding. Thus a "sound based" cue would be most facilitative for him.

A second explanation might be that the higher level judgement skills of the semantic system are significantly impaired, rendering the semantic system as a whole less efficient in

the retrieval process. If this is the case, it is unlikely the subject would be capable of making the conscious decision to adopt an alternate retrieval strategy; rather, what occurs is the gradual shifting toward sound cues as one experiences repeated failure with semantic cues at an unconscious or subconscious level.

Referring to the fifth and sixth research questions to be considered, another trend which appeared across subjects was increased retrieval time for the "extended discourse" condition. The trend agrees with what Williams (1983) suggested, which is that the type of retrieval involved when naming a single object is different from that used for active declarative sentences.

The increased response time during "extended discourse" suggests that the process of retrieval is one different from that utilized in simple confrontation naming. Several factors might explain this increased time consumption during "extended discourse," a number of which are described here. Williams (1983) suggested that the lack of knowledge regarding the target (i.e., being unsure as to target specificity) influences retrieval accuracy adversely. In an "extended discourse" situation, whether artificially contrived as in this study or as in a general conversation, there exist competing and distracting stimuli. With a variety of actions occurring and objects present, the problem of which target to retrieve becomes overwhelming. As a result, the time required to either deal with all possible targets, or consciously decide on one or a handful is greater.

Another explanation is that the subject may have visual or auditory difficulty. In the case of this study, such visual-perceptual factors as figure-ground or visual form constancy may have played a role. Thus, the pictures utilized to elicit the "extended discourse" may have contributed to the increased time consumption. Perceptual factors including figure-ground could adversely influence retrieval performance during conversational activity. As a result, "generalized word finding" would be more vulnerable to perceptual deficits than "anomia." Nicholas, Obler, Albert and Goodglass (1985) and Butterworth, Howard and McLoughlin (1984) acknowledge the role of perception in word retrieval. Both knowledge

of the target word and the possibility of perceptual interference may have contributed to increased circumlocution during this condition, thus increasing the amount of time being consumed by retrieval activities.

Another finding which was seen across subjects in this study was related to the type of responses generated. The proportion of "phonemically related" responses produced by all subjects was relatively low, and markedly less than the proportion of semantically related responses produced. This finding raises two possible hypotheses, one of which is that, phonemically related responses may not be representative of a "system" of storage, but might instead be more closely representative of some degree of motor planning or motor incoordination within the oral mechanism. The problematic issue here is why the level of phonemically related responses would be so much lower than semantically related ones if they both represent a system within the retrieval process. Intuitive reasoning would suggest the two should be equal. This suggested notion that a semantic system "over-rides" the phonemic system could be conceptualized as part five of Caramazza, Berndt and Brownell's (1982) steps for naming a task, or articulation.

The other hypothesis involves both perception and higher level semantic abilities. If, for example, this could be merely a reflection of the inability to recognize articulation errors, in the absence of a motor disability in which the subject has lost the ability to detect errors in articulation, then it may not be evidence of the phonological system at work. The working of the phonological system would require the ability to compare, contrast, and problem solve, skills which may or may not be impaired in the stroke survivors. The higher level semantic activities of comparing and contrasting, inclusion and exclusion, problem solving and prediction also appear to play a role when the retrieval mechanism is considered across the linguistic classes.

Referring to research question #2, all of the subjects in this study experienced the least degree of success in terms of the retrieval of superordinate categories. Assignment of an object to a "category" is clearly "higher" in their hierarchy of skills than is the simple

naming of an exemplar. Meta-linguistic judgements and comparisons must be made, all requiring detailed conceptualization. Then there is, as Caramazza, Berndt and Brownell (1982) discussed the importance of perceptual skills in this activity. It is suggested, however, that the subjects in this study had greater difficulty with categorical retrieval due to their inability to make the appropriate "meta-linguistic" judgements. Kany and Ellis (1987) indicated that this inability is the result of an impairment or disruption of the system at the semantic rather than the phonological level. If this is the case, and the inability to retrieve categorical names to the level of exemplar or verb retrieval is a result of being unable to carry out the linguistic and meta-linguistic judgements necessary for retrieval, it would be unreasonable to expect the stroke survivors to make those judgements as they relate to being able to use a cueing system. Moreoever, there is little use for a cueing system if it cannot be self-generated. The stroke survivors would experience difficulty even determining when to use the cueing system. This study has provided evidence to suggest that the meta-linguistic skills necessary to detect response errors are impaired, therefore it may be unreasonable to expect the skills necessary to identify a situation suitable for the use of self cueing to be present and available upon command.

Bowles and Poon (1985), Nicholas, Obler, Albert and Goodglass (1985) all spoke about word retrieval difficulties as they relate to the transfer of information from the semantic to the phonological system. They suggested that a response which was semantically related to the target word was either semantically misrepresented in the initial conceptualization stage, or response was not able to be mapped phonologically. It could be hypothesized that if the latter occurred, and phonological mapping was not possible, a higher proportion of phonemically related responses would be produced by the subjects of this study than what was found in the data. All subjects produced relatively low levels of phonemically related responses, suggesting once again that the disruption in the retrieval mechanism lies in the semantic system, the system which utilizes the higher level skills of

comparison and contrast, prediction and problem solving needed for making conscious meta-linguistic decisions. Kany and Ellis (1987) would concur with such a hypothesis.

One general trend mentioned previously, that the "nature" of the cue is critical to the retrieval process, requires further discussion. The fact that most of the subjects displayed at least partial inability to "monitor" their performance suggests that the salient feature of a successful cue is the degree of "direction" it brings to the linguistic search. If meta-linguistic decision making is impaired in any way, knowing "where to start" a linguistic search would be most problematic. The searcher would be given no indication how to even restrict the scope of the search. A cue, however, would serve to "focus" the search, thus reducing retrieval time and increasing the opportunity for successful retrieval. The more "direct" the cue the more focus and direction it gives to the search; the less direct the cue (for example, "extended discourse") the less focus and direction given to the search. The added factor of stimulus uncertainty would only serve to aggravate the lack of direction being brought to the search, as distraction by other stimuli interferes with the process. This is consistent with Williams and Canter (1987) and Pierce and DeStefano (1987), all of whom indicated that increased contextual information proves to interfere with retrieval. Therefore, the more precise and structured the cue, the more restricted the word search can become. Contextual information on the other hand, being unstructed and vague does not allow for restriction of the search.

There is little definitive evidence from this study to support Yeudall's notion of the "thalamic gate." As previously noted, all subjects improved with either a "phonemic" or semantic" cue. This should not have occurred if Yeudall's conceptualization is correct. Even so, in all but a few conditions there still existed a large proportion of incorrect responses. Why did a particular cue work at one time but not at another? At this point it is impossible to determine if the failure of a cue to elicit a target word was evidence for a thalamic gate or perhaps of perceptual fluctuation and neurological instability from day to

day or even hour to hour. This emphasizes the need for continued study in this area with even tighter subject selection restrictions and modified design features.

Given the preceding discussion of both within-subject and between-subject findings, it is now necessary to see how these findings answer the questions set out at the beginning of this study. One question was whether or not either semantic or phonemic cueing enhances retrieval. In answer to this it would seem that all subjects benefited maximally by one of these two cue types, but that there was no pattern of this benefit across subjects.

The second question is whether linguistic class plays a role in retrieval? This study would suggest it does. As Williams and Canter (1987) indicated, superordinate categories tend to be least benefited by cueing of any kind; exemplars and verbs were more readily influenced by cueing. Furthermore, it would appear that the skills involved in categorization (or the higher level semantic skills) are impaired, thus creating the difficulty in category retrieval. The inability to carry out the appropriate meta-linguistic decisions necessary for categorization seems to render the cues ineffective.

The third question posed by this study had to do with factors associated with inaccessibility of a word. The results suggest that the aforementioned inability to make the meta-linguistic judgements necessary for higher level organization adversely affects retrieval. There is also a definite possibility that auditory and visual perception play a role in accessibility. Finally, the type of cue in relation to the type of strategies used by the subject interact to influence accessibility of a given target word.

It is interesting to consider the possibility that in many cases, the type of the cue may not always be the most salient feature of the cue. Rather, it is the "directness" or "focusibility" of the cue, that seems to enhance retrieval. Thus, in many cases the mere "encouraging" of the subject serves to focus the linguistic search sufficiently to result in successful retrieval.

Considered in this study was the difference, if any, between "anomia" and "word retrieval." This study would suggest that they are two distinct processes. Anomia involves association between the word and object. Word finding on the other hand is influenced by context, and does not simply relate to the naming of objects. Word finding also requires less in terms of linguistic perceptual analysis. Comparison, contrast, class inclusion and exclusion are all necessary in category naming (anomia), but not in verb finding or exemplar finding, at least to the same degree. Each subject in this study diverged from their typical response pattern during "extended discourse," suggesting the dichotomy between these two processes.

Once again asking the question whether cueing does or does not enhance word retrieval, this study would suggest that it does, but that the enhancement appears to be a result of the cue's ability to direct and restrict the linguistic search, rather than aiding the phonological or semantic storage systems.

Limitations

First and foremost of the limitations encountered in this research project was subject accessibility. As only one half of the desired sample was secured, the results of this study are somewhat less representative of the population as a whole than it might otherwise have been. The results are less able to be generalized.

A second limitation, one which is common with research in this area, is the lack of premorbid information. Knowledge of the subjects' previous skills and strategy preferences would have been valuable.

In retrospect, the lack of perceptual testing at the time of subject selection was a third limitation. It would have been valuable in the subsequent interpretation of results; it would have provided some objective information regarding auditory and visual perception, which in this study could only be hypothesized.

Personal Observations

Some interesting questions arise when this study is considered more generally. A very crucial question which arises relates to the relationship between age and word retrieval. As the literature review revealed, there exists little evidence to link word retrieval deficits to age. Why then, is such a deficit virtually never observed in normal developing children? It is not until 25 or 30 years of age that people begin to comment on retrieval difficulties. A subjective analysis would say that the occurrence of the problems increases with age. The fact that retrieval difficulties are not seen in normal developing children, and begin to be observed in the late twenties, suggests neurological involvement. Thus arises the question of what factors are involved if the root of a retrieval deficit is in neurology? For example, do neurotransmitter imbalances play a role in this type of deficit. Or, is the problem related to deterioration of the myelin sheath? Could it be as Yeudall (1985) suggested and be due to a slowing down of the gates? Many possibilities exist and warrant future consideration.

Also warranting consideration is the relationship between the stroke survivor with a word retrieval deficit, and the learning disabled child with the same manifested symptom. Are these two disorders in fact the same? A notion which must be investigated relates to the "difference" between the two populations. Stroke survivors presumably already had in place, a functional, competent language system, prior to the retrieval deficit. Already developed were the vocabulary, semantics, syntactic rules, grammar, morphology and phonology of the language. This previously developed language system becomes disordered due to cerebral insult. On the other hand, the learning disabled child has yet to develop a functional language system. All the aforementioned components of such a system are incomplete, immature in nature. Therefore, a way to conceptualize a retrieval problem in the two populations (CVA and LD), is to consider that the CVA survivor has "lost" a skill, whereas the learning disabled child has yet to acquire such skills.

Like any research, this project has generated many questions. It serves well to illustrate the need for a "program of research" in the area of word retrieval.

Future Considerations

The fact that no two subjects in this study responded alike makes it necessary to consider several methodological issues, including the need for retrospective studies. Idiosyncratic and inconsistent response patterns make it necessary to consider factors such as site and scope of lesion in relation to the "preferred cue," and levels of success in aiding retrieval. For example, does a lesion in the anterior portion of the temporal lobe present different "preferences" than lesions associated with the posterior portion of the same lobe? Or, as with retrieval itself, is there no clear pattern to performance in relation to lesion? Moreover, what did the subjects do to retrieve words prior to their strokes? Knowledge of a subject's pre-stroke strategies would be extremely helpful. As one does not know who is going to suffer a stroke, this would be a difficult though not impossible task. A probe could be administered to all new non-stroke admissions to an Extended Care Centre for one year providing a data base for comparison to patients who subsequently suffer a stroke. This would provide insight into whether or not strategies are altered in response to cerebral insult and, moreover, whether an individual shows any knowledge of such an alteration.

This study also illustrates the need for a repeated measures design. There is no way to determine from this study whether the response of any one subject to any one condition is consistent over time. Considering the possibility that "phonemic" cueing may prove superior in eliciting a target word some days, and "semantic" cueing prove most superior on others, repeated measures of these conditions would be required to determine the degree of temporal consistency. Such measures might take the form of "daily probes" to determine stability over time. Not only would one want to consider consistency in the probes, but one would also want to consider the effect of "time of day" as a factor influencing retrieval. Clinicians dealing with aphasics' perceptual skills may see great variation not only day to day but hour to hour in these patients.

Closely related to this is the need for an auditory and visual perceptual skills screen administered to subjects. Brookshire (1978) does not even allude to perceptual skill-evaluation in the stroke survivors; rather, he merely insists on acuity testing. In many facilities, where a rehabilitation team is present, an intake screening of aphasic's neurological status, speech and language skills, auditory and visual acuity and perception, as well as emotional disposition could all be completed, providing the opportunity for multi-disciplinary consideration of such matters as word retrieval. Even psychological instruments such as the WAIS-R can give valuable insights into both visual and auditory perceptual functioning. Block Design, the reproduction of jigsaw-type puzzle forms and sentence repetition can each provide valuable information of perceptual skills.

Besides methodological issues there exist ethical questions. For instance, can the correct/incorrect ratio of a subject's response be improved upon? With the exception of only a few instances the proportion of correct response to any of the conditions was not particularly good. A large proportion of the responses were still incorrect. The semantically and phonemically related responses were still incorrect. If the ratio of correct/incorrect responses cannot be improved upon then the time and money spent on therapeutic endeavors is questionable. It is also worthwhile to consider whether the individual will ever learn to recognize situations in which cueing is required, and whether the individual will be able to initiate the appropriate self cueing strategy If the subject can learn to self cue, then one must also consider whether the subject can "monitor" his/her performance. If an individual cannot identify when successful retrieval has occurred, the retrieval is of little benefit. Questions such as these must be considered when evaluating the ethical value of such training.

The results of this study suggest that not all of the previous questions could be answered in the affirmative for all subjects. Consider the idiosyncratic differences which emerged across the five subjects. Subject #3, for example, gave indication of the inability to make judgements pertaining to the accuracy of his responses. Subject #2 appeared more

interested in receiving praise from the researcher, and appearing to "please" the researcher, than in striving for an accurate response. Subject #4 appeared to utilize one type of strategy, but if not immediately successful, abandoned the initial strategy and resorted to guessing. As previously discussed, most of the subjects had less retrieval success in contextual cueing, the situation which most closely duplicates everyday conversation. All subjects appeared less directed and less able to begin a search for the word within the contextual condition. If the extended discourse condition is representative of general conversation, the increased time required for successful retrieval might eliminate any perceived benefit in retrieval accuracy. As nurses, visitors and other interactors with the aphasic don't have time to wait for the patient to narrow in on the target, and quite probably find it nerve-racking, the value of such a technique may be lacking. If there is a benefit to cueing, the trained therapist may be the only one willing to wait for its benefit to appear.

The final question to be asked is whether or not an investment of time, effort and money into "cueing" results in worthwhile benefits. Would that time be better spent in developing an alternative or augmentative communication system? This question, like that of "which cue is best" cannot be "generally" answered, but must be considered on an individual basis, weighing the availability of resources, ecological validity, quality of life and the dignity of the aphasic. The solution, it would appear, is different for each person and cannot be generalized.

The most attractive solution would be a "probe" which could be administered to every new entrant to an organized facility such as a lodge, nursing home or hospital. Information pertaining to current style of retrieval and perceptual integrity could be placed on file in case of future stroke. It would also help to develop a differential diagnostic tool which could be repeated daily to ascertain consistency. It could consists of 10 selected retrieval activities which when carried out would provide the clinician with knowledge of an individual's retrieval patterns.

Such a tool would be as applicable in out-patient treatment facilities as it would in rehabilitation centres. By administering such a tool, a clinician could determine for any one individual whether phonemic, or semantic cueing is maximally effective, or whether the mere directing of the search is what is required. To arbitarily instruct a patient in one of the cueing systems, without some information as to preference, and consistency of preference defeats the purpose of the intervention.

A tool such as that described could be beneficial for more than just the CVA population, since it is reasonable to assume that the need for individual analysis also applies to word finding deficits in the learning disabled. Wiig and Semel (1980) indicate that word retrieval problems in the learning disabled population are due to semantic problems including: limitations in conceptualization, weak categorization, and poor comparison and interpretation. These problems should appear familiar, as they have been discussed in depth as they relate to aphasic word retrieval deficits. Even the types of incorrect responses repeatedly made by the learning disabled person are similar to those produced by the aphasic. Wiig and Semel (1980) refer to the use of synonyms, talking around the topic (circumlocution) stalling and use of imprecise words as common responses of learning disabled individuals. These researchers also state that learning disabled individuals continue to experience difficulty because "the abilities underlying word-finding are the same as those essential to higher level...learning."

The techniques used in the intervention of the learning disabled also closely parallel what has been discussed in this paper. Deshler (1978) advocates training individuals to "detect their own errors." Parker, Freston and Drew (1975) suggest developing personal approaches to material to aid recall and retrieval, again suggesting the need for in-depth individual analysis of the problem. Other suggestions for intervention include the highlighting of relationships, presumably making use of the individual's ability to contrast and compare. Parker et al. (1975) also write in terms of training the skill of making judgements, linguistic or otherwise.

The similarity of word retrieval difficulties between aphasics and the learning disabled population cannot be ignored. Ethical questions and concerns applied to the aphasic population in regards to word retrieval problems also apply to the learning disabled population. One critical difference which may emerge may be in the success of teaching the "meta-strategies" outlined in both intervention programs. The learning disabled individual is usually younger, in better physical health, and in a facility in which "training" will continue for several years. All these factors may contribute to the final success of such training.

Joint studies involving the word retrieval performance of both the aphasic population and the learning disabled populations would negate the ability to control for many extraneous factors. It would also disallow site of lesion studies. It would, however, provide insight into the likenesses and differences in a condition common to both populations - that of word retrieval.

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